UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:

JUN 27 2012

Richard Nelson, Field Supervisor
Rock Island Illinois Field Office
United States Fish and Wildlife Service
1511 47th Avenue
Moline, Illinois 61265

Dear Mr. Nelson:

Pursuant to Section 7 of the Endangered Species Act, (87 Stat. 884, as amended; 16 U.S. C. 1531 et seq.), the U. S. Environmental Protection Agency has reviewed the biological information and analysis related to a Prevention of Significant Deterioration (PSD) permit for the proposed Hoosier Energy REC, Inc. Landfill Gas to Energy project in Davis Junction, Illinois, to determine what impact there may be to any threatened or endangered species in the area around the facility. Hoosier Energy REC, Inc. is proposing to install seven reciprocating internal combustion engines and other equipment associated with a landfill gas to energy project. Golder Associates, Inc. has prepared an analysis for the project on behalf of the facility, dated October 2011 (See enclosure). EPA has reviewed the analysis and has determined that the project may affect, but is not likely to adversely affect, any federally listed species. The purpose of this letter is to seek concurrence from the U. S. Fish and Wildlife Service on our determination. If you have any questions with respect to this letter, please contact Rachel Rineheart, of my staff, at (312) 886-7017.

Sincerely,

Genevieve Damico

Genevieve Damico
Chief
Air Permits Section

Enclosure

cc: Laurel Kroak, IEPA

standard bcc's: official file copy w/attachment(s)
originator's file copy w/attachment(s)
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ARD:APB:APS:Rineheart: 6/26/12
DISKETTE/FILE: C:\epawork\documents\ESA\ESA Biological Evaluation Cover Letter Hoosier Energy

ECOLOGICAL RISK ASSESSMENT FOR FEDERAL ENDANGERED/THREATENED SPECIES

Hoosier Energy REC, Inc.

Landfill Gas to Energy Project in Davis Junction

Submitted To: Hoosier Energy REC, Inc.
7398 N. State Road 37
PO Box 908
Bloomington, IN 47402

Submitted By: Golder Associates Inc.
1751 W. County Road B, Suite 105
Roseville, MN 55113 USA

Distribution: Hoosier Energy REC, Inc.
Golder Associates Inc.

October 2011

Project No. 103-81277

A world of capabilities delivered locally

Golder Associates

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1.0 INTRODUCTION

Golder Associates Inc. (Golder) performed an ecological risk assessment (ERA) screening evaluation to determine whether the proposed Landfill Gas to Energy Facility in Davis Junction (Proposed Project) owned and operated by Hoosier Energy REC, Inc (Hoosier) is likely to directly or indirectly adversely affect federally endangered or threatened species that could potentially exist in the area. This evaluation is required for compliance with Section 7 of the Federal Endangered Species Act. The following is a description of the proposed modifications:

- Seven 3,764 bhp reciprocating internal combustion engines driving electrical generators that will generate electricity up to 8,760 hours per year.
- One thermal oxidizer that will destroy offgas from the siloxane removal system that can operate up to 8,760 hours per year.

The following processes will also occur, but are either insignificant or do not emit regulated air pollutants:

- Siloxane removal system
- Sulfur treatment system
- Enclosed landfill gas particulate filters
- Landfill gas blowers
- Landfill gas dehydration systems
- New and waste oil storage tanks

This Proposed Project will purchase the landfill gas from the Veolia ES Landfill (Landfill) and combust it in the engines to generate electricity for sale to the grid.

The Proposed Project is a major source under PSD for CO, NOx, VOC, PM, PM10, and PM2.5.

A recommended scope of analysis was obtained from the U.S. EPA on May 5, 2011 for the Proposed Project (see Appendix A). The scope of analysis identifies three species that must be considered:

- Prairie Bush Clover
- Indiana Bat
- Eastern Prairie Fringe Orchid

Figure 1 shows the Proposed Project location, property boundary, and areas where each of the three species are likely to be located within the assessment area of 3.0 km.

2.0 DISCUSSION

2.1 Emissions

The Landfill currently collects landfill gas from the active gas collection system and routes it to one of two flares. The flares combust the landfill gas as required by federal regulations. Hoosier is proposing to construct the Proposed Project at the landfill that will take the landfill gas, route it to a sulfur treatment system to remove sulfur, filter the gas, and combust the gas in engines to generate electricity. Worst case emissions are based on the maximum predicted landfill gas production. The landfill gas will supply the needs of the Proposed Project first with the remaining landfill gas being combusted in the Landfill's open flare. Hoosier will also operate a thermal oxidizer which is required as part of the siloxane removal system. Table 2.1 shows the predicted worst case emissions from the Landfill prior to the modification and the predicted emissions assuming all the landfill gas is combusted in the new engines/thermal oxidizer (with the leftover gas routed to the Landfill's open flare).

Table 2.1: Predicted Emissions Before and After the Modification

Pollutant	Potential to Emit Before Proposed Modification (tpy)	Potential to Emit After Proposed Modification (tpy)
NOx	76.2	185.8
CO	333.6	804.2
SO_2	490 (permit limit)	211.9
VOC	9.5	87.7
PM2.5	22.4	34.4
PM10	22.4	35.4
PM	22.4	38.2
GHG	142,127	150,008
MAX HAP	6.6	9.7
TOTAL HAP	7.8	25.7

The emission increases are a result of switching combustion technologies from a flare to internal combustion engines. The flare produces fewer emissions, but is 0% efficient at capturing and using the generated heat, where an engine produces more emissions, but transforms the energy into electricity with an overall efficiency of approximately 41%[1]. The sulfur emissions will decrease because the engines require a lower concentration of sulfur in the fuel than the Landfill flares. The Proposed Project includes a sulfur treatment system to reduce sulfur in the fuel to 140 ppmv or less.

[1] Manufacturer specification dated December 2010 lists an electrical efficiency of 41.3%.

2.2 Dispersion Modeling

The Proposed Project used the U.S. Environmental Protection Agency's (EPA) AERMOD model version 11103 to demonstrate compliance with national ambient air quality standards. Particle phase deposition and ambient air concentration modeling was conducted. Guidance from Chapter 3 of the *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities*[2] was used in the modeling. The particle phase deposition model uses the following assumptions:

- Receptor grid extends 3 km
- All stacks are assumed to have less than 10% of the particulate matter emitted with particle diameter greater than 10 microns
- All stacks assume a fine particle fraction of 1.0 and a mass mean particle diameter of 1.0 microns
- Seven engines are combined and modeled using 1.0 g/s (unitized emission factor)
- Thermal oxidizer is modeled at 1.0 g/s
- Landfill open flare is modeled at 1.0 g/s

The concentration and deposition models were run for short term (1-hr, 8-hr, 24-hr) and long term (annual) averaging times. The resulting unitized concentration and deposition dispersion factors are used to estimate the deposition rate for various pollutants based on the fact that the impact is directly proportional to the emission rate. Figures 2, 3, and 4 show plots of the 5-year deposition rate for the emission units. The AERMOD input and output files are included in Appendix B. The following table shows the unitized deposition dispersion factors:

Table 2.2a: Unitized Particle Deposition Dispersion Factors

Averaging Time	7 Engines Maximum Total Deposition Rate (g/m^2 per g/sec)	Thermal Oxidizer Maximum Total Deposition Rate (g/m^2 per g/sec)	Landfill Open Flare Maximum Total Deposition Rate (g/m^2 per g/sec)
1-hr	0.00055	0.0005	0.00009
8-hr	0.00205	0.00219	0.00045
24-hr	0.00209	0.00237	0.00047
Annual	0.04828	0.03868	0.00475

Notes: Annual factor based on the 5-year factor divided by 5.

[2] Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (Final), September 2005, U.S. EPA

The ambient air concentration model was also run with similar assumptions in regulatory default mode. Figures 5, 6, and 7 show the 1-hour unitized concentration dispersion factor in 5 years for the emission units. The following table shows the annual unitized concentration dispersion factors:

Table 2.2b: Unitized Concentration Dispersion Factors

Averaging Time	7 Engines Maximum Total Deposition Rate (μg/m³ per g/sec)	Thermal Oxidizer Maximum Total Deposition Rate (μg/m³ per g/sec)	Landfill Open Flare Maximum Total Deposition Rate (μg/m³ per g/sec)
1-hr	19.60	31.10	2.55
8-hr	16.93	26.57	1.62
24-hr	12.02	16.56	0.71
Annual	0.69	0.61	0.03

Notes: Annual factor based the average over a 5 year period.

TABLE 2.2c - DEPOSITION FROM UNITIZED PARTICLE DEPOSITION FACTORS (PDFs)

NO_2 DEPOSITION (TOTAL)

	1-hr PDF (g/sq m per g/s)	Emission Rate (g/s)	Impact (g/sq m)	8-hr PDF (g/sq m per g/s)	Emission Rate (g/s)	Impact (g/sq m)	24-hr PDF (g/sq m per g/s)	Emission Rate (g/s)	Impact (g/sq m)	5YR PDF (g/sq m per g/s)	Emission Rate (g/s)	Impact (g/sq m)
ICE	0.00055	4.39000	0.00241	0.00205	4.39000	0.00900	0.00209	4.39000	0.00918	0.24136	4.39000	1.05957
TO	0.00050	0.13900	0.00007	0.00219	0.13900	0.00030	0.00237	0.13900	0.00033	0.19337	0.13900	0.02688
FLARE	0.00009	0.81400	0.00007	0.00045	0.81400	0.00037	0.00047	0.81400	0.00038	0.02372	0.81400	0.01931
			0.00256			0.00967			0.00989			1.10576

SO_2 DEPOSITION (TOTAL)

	1-hr PDF (g/sq m per g/s)	Emission Rate (g/s)	Impact (g/sq m)	8-hr PDF (g/sq m per g/s)	Emission Rate (g/s)	Impact (g/sq m)	24-hr PDF (g/sq m per g/s)	Emission Rate (g/s)	Impact (g/sq m)	5YR PDF (g/sq m per g/s)	Emission Rate (g/s)	Impact (g/sq m)
ICE	0.00055	1.06100	0.00058	0.00205	1.06100	0.00218	0.00209	1.06100	0.00222	0.24136	1.06100	0.25608
TO	0.00050	0.08800	0.00004	0.00219	0.08800	0.00019	0.00237	0.08800	0.00021	0.19337	0.08800	0.01702
FLARE	0.00009	4.94700	0.00045	0.00045	4.94700	0.00223	0.00047	4.94700	0.00233	0.02372	4.94700	0.11734
			0.00107			0.00459			0.00475			0.39044

EXPLICIT NO_2 AND SO_2 DEPOSITION MODEL RESULTS

EXPLICIT NO_2 DEPOSITION MODEL (5 YEARS)

	Wet Deposition (g/m2)	Dry Deposition (g/m2)	Total Deposition (g/m2)	
ALL	0.0011	1.1042	1.1045	Five Year Deposition Rate
ALL	0.0002	0.2208	0.2209	In units of g/m2 per year as NO_2
ALL	0.0022	2.2085	2.2090	In units of kg/hectare per year as NO_2

Multiply by 1.35 to obtain NO3
Multiply by 0.30 to obtain Nitrogen

EXPLICIT SO_2 DEPOSITION MODEL (5 YEARS)

	Wet Deposition (g/m2)	Dry Deposition (g/m2)	Total Deposition (g/m2)	
ALL	0.0016	0.3848	0.3850	Five Year Deposition Rate
ALL	0.0003	0.0770	0.0770	In units of g/m2 per year as SO_2
ALL	0.0032	0.7695	0.7699	In units of kg/hectare per year as SO_2

Multiply by 1.25 to obtain SO_3
Multiply by 1.50 to obtain SO_4
Multiply by 0.50 to obtain Sulfur

ICE = Seven Internal Combustion Engines
TO = Thermal Oxidizer
FLARE = Landfill Flare
ALL = ICE + TO + FLARE

2.3 Risk Characterization

The following sources/lists were used to identify ecological screening benchmarks and determine whether deposition and ambient concentrations exceeded the benchmark for any emissions from the Proposed Project:

1. EPA Ecological Soil Screening Levels (ECO-SSLs)[3]
2. U.S. EPA, Region 5 has a list of ecological screening levels (ESLs)[4]
3. Michigan Department of Natural Resources Toxics Screening Level Database[5]
4. Minnesota Risk Assessment Screening Spreadsheet[6]

The ECO-SSLs established the base benchmarks, and then the ESLs provided missing values for emissions from the Proposed Project that were not listed in the ECO-SSLs. Finally, the Michigan and Minnesota data were used to complete the benchmarks. These values are known as screening levels where if a project's impacts at less than the screening level, there is assumed to be no adverse ecological impact.

[3] http://www.epa.gov/ecotox/ecossl/

[4] http://www.epa.gov/reg5rcra/ca/ESL.pdf

[5] http://www.deq.state.mi.us/itslirsl/

[6] http://www.pca.state.mn.us/index.php/air/air-monitoring-and-reporting/air-emissions-and-monitoring/air-emission-risk-analysis-aera/risk-assessment-screening-spreadsheet-rass-and-q/chi-spreadsheet-aera.html

2.4 Ecological Soil Screening Levels

The EPA Ecological Soil Screening Levels (ECO-SSLs) are a set of concentrations of contaminants in the soil that are protective of ecological receptors and are a recommended set of screening standards for this evaluation. The EPA has issued interim ECO-SSLs for the following metals and compounds:

- Aluminum
- Antimony
- Arsenic
- Barium
- Beryllium
- Cadmium
- Chromium
- Cobalt
- Copper
- Iron
- Lead
- Manganese
- Nickel
- Selenium
- Silver
- Vanadium
- Zinc
- DDT and metabolites
- Dieldrin
- Pentachlorophenol
- Total polycyclic aromatic hydrocarbons (PAHs)

Most of the benchmark constituents above are metals. Metals are not typically found in gaseous fuel such as natural gas and landfill gas because they require a solid or liquid media to adhere to and none are identified with the Proposed Project. DDT and dieldrin are both environmentally persistent insecticides and have been banned from use in the United States. There is no evidence that these compounds exist in the landfill and thus, will not be emitted from Proposed Project. Total PAH's can be formed and emitted from the Proposed Project's engines. There are no emission factors for PAH from the thermal oxidizer and the Landfill's flares. PAH emission from these emission units are not expected due to the high operating temperatures.

The ECO-SSLs for PAH are listed below:

Table 2.4: ECO-SSL for Polycyclic Aromatic Hydrocarbons (mg/kg dry weight in soil)

Description	Plants	Soil Invertebrates	Wildlife Avian	Wildlife Mammalian
Low Molecular Weight PAH	NA	29	NA	100
High Molecular Weight PAH	NA	18	NA	1.1

Notes: High molecular weight means there are four or more rings. Low molecular weight means there are less than four rings.

The PAH emission rate from all seven engines is 0.022 tpy[7]. Most PAHs have boiling points in excess of ambient temperature, therefore it is expected that deposition will occur from particle deposition. The PAH deposition rate is estimated by multiplying the emission rate by the unitized deposition dispersion factor. The total (wet + dry) deposition of PAH predicted by this model at the point of maximum impact is 0.00024 grams per square meter per year. At this deposition rate, it would take 2,383 years to accumulate to the lowest ECO-SSL of 1.1 mg/kg assuming all of the PAH is high molecular weight as shown by the calculation below:

1. PAH Emission rate: 0.022 tpy = 0.0049 lb/hr
2. Maximum Deposition Rate : (0.048 g/m^2 per g/s per year) * (0.0006 g/s) = 0.00003 g PAH/m^2 - yr
3. Assumed dry density of soil : 1.3 g/cm^3 = 1,300 kg/m^3
4. Assume PAHs accumulate in top 5 cm of soil
5. Mass of dry soil measuring 1 square meter by 0.05 m deep : (1,300 kg/m^3)*(0.05 m)*(1 m^2) = 65 kg SOIL/m^2
6. Years to meet ECO-SSL: (1.1 mg/kg) / [(0.03 mg PAH/m^2 - year) / (65 kg SOIL/m^2)] = 2,383 years

The above calculation assumes that the PAHs do not break down and are not removed by other means (leaching into groundwater). Realistically, over the course of 2,000+ years, some or all of the PAH would be decomposed or displaced. The expected life of the Proposed Project is assumed to be 30 years therefore the impact from PAHs is not significant.

2.5 RCRA Ecological Screening Levels

The U.S. EPA, Region 5 has a list of ecological screening levels (ESLs) which are used to determine which pollutants should be evaluated further. If a project's impacts are less than the corresponding ESLs, then the pollutant is not considered an ecological risk. The ESLs list identifies screening levels for air, water, sediment, and soil. This analysis compares the air and soil ESLs to the maximum deposition rate for soils and the maximum ambient concentration rate from the Proposed Project for each pollutant. There were several compounds for which the Region 5 list did not identify an ESL. The Michigan and Minnesota sources from Section 2.3 were used to provide screening level benchmarks for missing values from the first two sources.

The air impact is estimated by multiplying the emission rate by the unitized concentration dispersion factor for each type of emission unit (IC engines, Thermal Oxidizer, and the Landfill Open Flare). The 1-hr averaging period results in the highest impact for this analysis. This is the most conservative estimate as not all pollutants have impacts derived from 1-hour averaging periods. The modeled maximum impact is compared to the ESLs. The predicted impact for each pollutant will be less than 0.4% of the ESL, therefore, this project does not present ecological risk from the Proposed Project ambient air impacts.

[7] See Table 1. PAH emission rate = 0.000617 g/s = 0.022 tpy

The soil deposition is estimated by multiplying the emission rate by the unitized deposition dispersion factor for each type of emission unit (IC engines, Thermal Oxidizer, and the Landfill Open Flare). This model assumes that all emissions eventually fall to the ground. The total deposition for a 30 year period assumes the maximum deposition rate and that the deposited pollutant builds up in the top 5 cm of soil with no degradation or displacement. This is the most conservative assumption for the following reasons:

- Much of the surrounding land is cropland, which is tilled on an annual basis to a depth that exceeds 5 cm. Deeper tilling means the concentration of a pollutant in the soil will decrease.
- Some of the pollutants will degrade over the course of 30 years.
- Some of the pollutants will be displaced by water, which will move some of the pollutants away from the point of maximum impact.

The maximum predicted 30 year accumulation of benzene will be 88.1% of the ESL. Benzene is a volatile compound and will readily evaporate at the surface of the soil. Benzene in the soil is highly mobile and will readily displaced by water. All of the predicted soil concentrations are less than the corresponding ESL, therefore the Proposed Project does not present an ecological risk due to soil accumulation.

Water and sediment ESLs were not considered for the Proposed Project. The dispersion patterns for the Proposed Project show that the annual maximum impacts drop to approximately 25% of the maximum impact within 800 meters from the emission units. A significant portion of impact area is on the Landfill. There are no major water bodies located within 800 meters of Proposed Project. The closest water body is a stream located approximately 2,000 meters east of Proposed Project. There are no lakes of significant recreational value within the 3 kilometer assessment area. It is not possible for pollutants to concentrate in a stream because water is flowing; therefore, it is also difficult for pollutants to accumulate in sediment. It is reasonable to assume that because there are no major water bodies near the point of maximum impact and that the highest impacts remain close to the Proposed Project, the impacts to water and sediment are not a significant concern.

See Table 2.5 for a detailed list of the ESLs and the predicted air and soil concentrations.

TABLE 2.5 - U.S. EPA Region 5 - RCRA Ecological Screening Levels

Parameter	Value	Units	Source
LFG Flow to 7 Engines	6,042	SCFM	Maximum Permitted Capacity
LFG Flow to Thermal Oxidizer (TO)	500	SCFM	Maximum Permitted Capacity
LFG Flow to Landfill Open Flare	3,485	SCFM	Balance gas
LFG Heating Value	502	btu/SCF HHV	Assumed
Unitized Concentration Dispersion Factor (1-hr)	19.60	µg/m³ (ICE)	AERMOD Dispersion Model
	31.10	µg/m³ (TO)	AERMOD Dispersion Model
	2.54	µg/m³ (Flare)	AERMOD Dispersion Model
Unitized Concentration Dispersion Factor (Annual)	0.69	µg/m³ (ICE)	AERMOD Dispersion Model
	0.61	µg/m³ (TO)	AERMOD Dispersion Model
	0.03	µg/m³ (Flare)	AERMOD Dispersion Model
Unitized Particle Deposition Dispersion Factor (Annual)	0.04828	g/m2 per g/s (ICE)	AERMOD Dispersion Model
	0.03868	g/m2 per g/s (TO)	AERMOD Dispersion Model
	0.00475	g/m2 per g/s (Flare)	AERMOD Dispersion Model

SEVEN INTERNAL COMBUSTION ENGINES

Pollutant	CAS	Emission Factor		Emission Rate (g/s)	ESL, Air (mg/m3)	Max Air Concentration (mg/m³)	% of ESL, Air	ESL, Soil (ug/kg)	Max Deposition (30 yr) (ug/kg)	% ESL, Soil
1,1,2,2 Tetrachloroethane	79-34-5	4.00E-05	lb/MMBtu	9.17E-04	353	1.80E-05	0.0000%	127	20.4	16.09%
1,1,2-Trichloroethane	79-00-5	3.18E-05	lb/MMBtu	7.29E-04	11.6	1.43E-05	0.0001%	28,600	16.2	0.06%
1,1-Dichloroethane	75-34-3	2.36E-05	lb/MMBtu	5.41E-04	1240	1.06E-05	0.0000%	20,100	12.1	0.06%
1,2,3-Trimethylbenzene	726-73-8	2.30E-05	lb/MMBtu	5.27E-04			NL			
1,2,4-Trimethylbenzene	95-63-6	1.43E-05	lb/MMBtu	3.28E-04	0.22 (A)	6.43E-06	0.0029%	NL		
1,2-Dichloroethane	107-06-2	2.36E-05	lb/MMBtu	5.41E-04	29.7	1.06E-05	0.0000%	21,200	12.1	0.06%
1,2-Dichloropropane	78-87-5	2.69E-05	lb/MMBtu	6.17E-04	70.6	1.21E-05	0.0000%	32,700	13.7	0.04%
1,3,5-Trimethylbenzene	108-67-8	3.38E-05	lb/MMBtu	7.75E-04	0.22 (A)	1.52E-05	0.0069%	NL		
1,3-Butadiene	106-99-0	2.67E-04	lb/MMBtu	6.12E-03	0.002 (A)	1.20E-04	5.9999%	NL		
1,2-Dichloropropene	#N/A	2.64E-05	lb/MMBtu	6.05E-04	5.89	1.19E-05	0.0002%	398	13.5	3.39%
2-Methylnaphthalene	91-57-6	3.32E-05	lb/MMBtu	7.61E-04	0.010 (A)	1.49E-05	0.1492%	3,240	17.0	0.52%
2,2,4-Trimethylpentane	540-84-1	2.50E-04	lb/MMBtu	5.73E-03	3.500 (A)	1.12E-04	0.0032%	NL		
Acenapthene	83-32-9	1.25E-06	lb/MMBtu	2.87E-05	0.210 (A)	5.62E-07	0.0003%	682,000	0.6	0.00%
Acenapthylene	203-96-8	5.53E-06	lb/MMBtu	1.27E-04	NL			682,000	2.8	0.00%
Acetaldehyde	75-07-0	8.36E-03	lb/MMBtu	1.92E-01	0.009 (A)	3.76E-03	41.7473%	NL		
Acrolein	107-02-8	5.14E-03	lb/MMBtu	1.18E-01	0.578	2.31E-03	0.3997%	5,270	2626.3	49.84%
Benzene	71-43-2	4.40E-04	lb/MMBtu	1.01E-02	9.76	1.98E-04	0.0020%	255	224.8	88.17%
Benzo(b)fluroanthene	205-99-2	1.66E-07	lb/MMBtu	3.81E-06	0.00001 (B)	2.61E-09	0.0522%	59,800	0.1	0.00%
Benzo(e)pyrene	192-97-2	4.15E-07	lb/MMBtu	9.52E-06			NL			
Benzo(g,h,i)perylene	191-24-2	4.14E-07	lb/MMBtu	9.49E-06	0.012 (A)	1.86E-07	0.0016%	119,000	0.2	0.00%
Biphenyl	92-52-4	2.12E-04	lb/MMBtu	4.86E-03	0.015 (A)	9.53E-05	0.6352%	NL		
Butane	106-97-8	5.41E-04	lb/MMBtu	1.24E-02	23.800 (A)	2.43E-04	0.0010%	NL		
Buty/Isobutyraldehyde	78-84-2	1.01E-04	lb/MMBtu	2.32E-03	0.160 (A)	4.54E-05	0.0284%	NL		
Carbon Tetrachloride	56-23-5	3.67E-05	lb/MMBtu	8.42E-04	1.41	1.65E-05	0.0012%	2,980	18.8	0.63%
Chlorobenzene	108-90-7	3.04E-05	lb/MMBtu	6.97E-04	120	1.37E-05	0.0000%	13,100	15.5	0.12%
Chloroethane	75-00-3	1.87E-06	lb/MMBtu	4.29E-05	20	8.40E-07	0.0000%	NL		
Chloroform (trichloromethane)	67-66-3	2.85E-05	lb/MMBtu	6.54E-04	1.34	1.28E-05	0.0010%	1,190	14.6	1.22%
Chrysene	218-01-9	6.93E-07	lb/MMBtu	1.59E-05	0.00001 (B)	1.09E-08	0.2178%	4,730	0.4	0.01%
Cyclopentane	287-92-3	2.27E-04	lb/MMBtu	5.21E-03	17.200 (A)	1.02E-04	0.0006%	NL		
Ethane	74-84-0	1.05E-01	lb/MMBtu	2.41E+00			NL			
Ethylbenzene	100-41-4	3.97E-05	lb/MMBtu	9.10E-04	304	1.78E-05	0.0000%	5,160	20.3	0.39%
Ethylene Dibromide	106-93-4	4.43E-05	lb/MMBtu	1.02E-03	0.009 (A)	1.99E-05	0.2212%			
Fluoranthene	206-44-0	1.11E-06	lb/MMBtu	2.55E-05	0.140 (A)	4.99E-07	0.0004%	122,000	0.6	0.00%
Fluorene	86-73-7	5.67E-06	lb/MMBtu	1.30E-04	0.140 (A)	2.55E-06	0.0018%	122,000	2.9	0.00%
Formaldehyde	50-00-0	4.47	lb/MMcf	2.04E-01	0.001 (B)	1.40E-04	17.4931%	NL		
Methanol	67-56-1	2.50E-03	lb/MMBtu	5.73E-02	3.250 (A)	1.12E-03	0.0346%	NL		
Methylcyclohexane	108-87-2	1.23E-03	lb/MMBtu	2.82E-02	16.000 (A)	5.53E-04	0.0035%	NL		
Methylene Chloride (Dichloromethane)	75-09-2	2.00E-05	lb/MMBtu	4.59E-04	0.002 (A)	8.99E-06	0.4494%	NL		
n-Hexane	110-54-3	1.11E-03	lb/MMBtu	2.55E-02	0.700 (A)	4.99E-04	0.0713%	NL		
n-Nonane	111-84-2	1.10E-04	lb/MMBtu	2.52E-03	0.550 (A)	4.94E-05	0.0090%	NL		
n-Octane	111-65-9	3.51E-04	lb/MMBtu	8.05E-03			NL			
n-Pentane	109-66-0	2.60E-03	lb/MMBtu	5.96E-02	17.700 (A)	1.17E-03	0.0066%	NL		
Naphthalene	91-20-3	7.44E-05	lb/MMBtu	1.71E-03	80.1	3.34E-05	0.0000%	99	38.0	38.24%
PAH	N/A	2.69E-05	lb/MMBtu	6.17E-04	0.00001 (B)	4.23E-07	8.4554%	NL		
Phenanthrene	85-01-8	1.04E-05	lb/MMBtu	2.38E-04	0.001 (B)	1.63E-07	0.0204%	45,700	5.3	0.01%
Phenol	108-95-2	2.40E-05	lb/MMBtu	5.50E-04	4.31	1.08E-05	0.0003%	120,000	12.3	0.01%
Propane	74-98-6	4.19E-02	lb/MMBtu	9.61E-01			NL			
Pyrene	129-00-0	1.36E-06	lb/MMBtu	3.12E-05	0.100 (A)	6.11E-07	0.0006%	78,500	0.7	0.00%
Styrene	100-42-5	2.36E-05	lb/MMBtu	5.41E-04	0.946	1.06E-05	0.0011%	4,690	12.1	0.26%
Toluene	108-88-3	4.08E-04	lb/MMBtu	9.36E-03	1040	1.83E-04	0.0000%	5,450	208.5	3.83%
Vinyl Chloride	75-01-4	1.49E-05	lb/MMBtu	3.42E-04	0.221	6.70E-06	0.0030%	646	7.6	1.18%
Xylene (o,m,p)	1332-20-7	1.84E-04	lb/MMBtu	4.22E-03	135	8.27E-05	0.0001%	10,000	94.0	0.94%

LFG = Landfill Gas

NL = Not Listed

Emission Factors from AP42 Table 3.2-2, 7/00, except for formaldehyde which is based on the maximum rate listed in the California Toxics Emission Factor database for landfill gas combustion in internal combustion engines.

Max Air Concentration Calculation: (emission rate, g/s) * (dispersion factor, µg/m³ per g/s) / (1000 µg/mg)

Max Deposition Calculation: (emission rate, g/s) * (deposition factor, g/ sq meter per g/s per year) / (65 kg soil/ dry cubic meter) * (30 years) * (1,000,000 ug/g), assume soil depth = 0.05 meters.

ESL = U.S. EPA, Region 5, RCRA Ecological Screening Level (unless otherwise noted)

(A) No data available in Region 5, RCRA ESL List. This value is from the Michigan Air Toxics System Initial Risk Screening Level database. Compared to the maximum 1-hr impa

(B) No data available in Region 5, RCRA ESL List. This value is from the Michigan Air Toxics System Initial Risk Screening Level database. Compared to the maximum Annual im

TABLE 2.5 - U.S. EPA Region 5 - RCRA Ecological Screening Levels										
THERMAL OXIDIZER										
Pollutant	CAS	Site Specific Concentration (ppmv)		Emission Rate (g/s)	ESL, Air (mg/m3)	Max Air Concentration (mg/m³)	% of ESL, Air	ESL, Soil (ug/kg)	Max Deposition (30 yr) (ug/kg)	% ESL, Soil
1,1-Dichloroethane (ethylidene dichloride)	75343	0.74	ppmv	7.16E-04	1240	2.23E-05	0.0000%	20,100	12.8	0.06%
1,1-Dichloroethene (vinylidene chloride)	75354	0	ppmv	0.00E+00	0.303	0.00E+00	0.0000%	8,280	0.0	0.00%
1,2-Dichloroethane (ethylene dichloride)	107062	0.2	ppmv	1.93E-04	29.7	6.02E-06	0.0000%	21,200	3.5	0.02%
1,4-Dichlorobenzene	106467	0.38	ppmv	5.46E-04	270	1.70E-05	0.0000%	2,960	9.7	0.33%
Carbonyl sulfide	463581	1.6	ppmv	9.39E-04	0.009 (B)	5.72E-07	0.0064%	NL		
Carbon disulfide	75150	0.27	ppmv	2.01E-04	3.67	6.25E-06	0.0002%	94	3.6	3.81%
2,2,4-Trimethylpentane	540841	2.6	ppmv	2.90E-03	3.500 (A)	9.03E-05	0.0026%	NL		
Dichloromethane (methylene chloride)	75092	6	ppmv	4.98E-03	0.002 (B)	3.03E-06	0.1517%	NL		
Ethylbenzene	100414	4.7	ppmv	4.88E-03	304	1.52E-04	0.0000%	5,160	87.0	1.69%
Hexane	110543	15	ppmv	1.26E-02	0.700 (A)	3.93E-04	0.0561%	NL		
Methyl isobutyl ketone	108101	1.87	ppmv	1.83E-03	3.000 (A)	5.69E-05	0.0019%	NL		
Styrene	100425	1.7	ppmv	1.73E-03	0.946	5.38E-05	0.0057%	4,690	30.9	0.66%
Perchloroethylene (tetrachloroethene)	127184	2.3	ppmv	3.73E-03	69	1.16E-04	0.0002%	9,920	66.6	0.67%
Trichloroethylene	79016	2	ppmv	2.57E-03	1220	7.99E-05	0.0000%	12,400	45.8	0.37%
Vinyl chloride	75014	1.1	ppmv	6.72E-04	0.221	2.09E-05	0.0095%	646	12.0	1.86%
Benzene	71432	1.2	ppmv	9.16E-04	9.76	2.85E-05	0.0003%	255	16.4	6.41%
Toluene	108883	39	ppmv	3.51E-02	1040	1.09E-03	0.0001%	5,450	626.9	11.50%
Xylene (isomers and mixtures)	1330207	14.8	ppmv	1.54E-02	135	4.78E-04	0.0004%	10,000	274.1	2.74%
HCl	7647010	N/A	ppmv	9.45E-03	0.020 (A)	2.94E-04	1.4694%	NL		
LANDFILL FLARE										
Pollutant	CAS	Site Specific Concentration (ppmv)		Emission Rate (g/s)	ESL, Air (mg/m3)	Max Air Concentration (mg/m³)	% of ESL, Air	ESL, Soil (ug/kg)	Max Deposition (30 yr) (ug/kg)	% ESL, Soil
1,1-Dichloroethane (ethylidene dichloride)	75343	0.74	ppmv	6.44E-03	1240	1.64E-05	0.0000%	20,100	14.1	0.07%
1,2-Dichloroethane (ethylene dichloride)	107062	0.2	ppmv	1.74E-03	29.7	4.42E-06	0.0000%	21,200	3.8	0.02%
1,4-Dichlorobenzene	106467	0.38	ppmv	4.91E-03	270	1.25E-05	0.0000%	2,960	10.8	0.36%
Carbonyl sulfide	463581	1.6	ppmv	8.45E-03	0.009 (B)	2.87E-07	0.0032%	NL		
Carbon disulfide	75150	0.27	ppmv	1.81E-03	3.67	4.59E-06	0.0001%	94	4.0	4.21%
2,2,4-Trimethylpentane	540841	2.6	ppmv	2.61E-02	3.500 (A)	8.12E-04	0.0232%	NL		
Dichloromethane (methylene chloride)	75092	6	ppmv	4.48E-02	0.002 (B)	1.52E-06	0.0760%	NL		
Ethylbenzene	100414	4.7	ppmv	4.39E-02	304	1.11E-04	0.0000%	5,160	96.2	1.86%
Hexane	110543	15	ppmv	1.14E-01	0.700 (A)	2.89E-04	0.0413%	NL		
Methyl isobutyl ketone	108101	1.87	ppmv	1.65E-02	3.000 (A)	4.18E-05	0.0014%	NL		
Styrene	100425	1.7	ppmv	1.56E-02	0.946	3.96E-05	0.0042%	4,690	34.1	0.73%
Perchloroethylene (tetrachloroethene)	127184	2.3	ppmv	3.36E-02	69	8.52E-05	0.0001%	9,920	73.6	0.74%
Trichloroethylene	79016	2	ppmv	2.31E-02	1220	5.87E-05	0.0000%	12,400	50.7	0.41%
Vinyl chloride	75014	1.1	ppmv	6.05E-03	0.221	1.54E-05	0.0069%	646	13.3	2.05%
Benzene	71432	1.2	ppmv	8.24E-03	9.76	2.09E-05	0.0002%	255	18.1	7.09%
Toluene	108883	39	ppmv	3.16E-01	1040	8.03E-04	0.0001%	5,450	692.8	12.71%
Xylene (isomers and mixtures)	1330207	14.8	ppmv	1.38E-01	135	3.51E-04	0.0003%	10,000	303.0	3.03%
HCl	7647010	N/A	ppmv	5.29E-06	0.020 (A)	1.34E-08	0.0001%	NL		

LFG = Landfill Gas
NL = Not Listed
Emission Factors from AP42 Table 3.2-2, 7/00, except for formaldehyde which is based on the maximum rate listed in the California Toxics Emission Factor database for landfill
Max Air Concentration Calculation: (emission rate, g/s) * (dispersion factor, µg/m³ per g/s) / (1000 µg/mg)
Max Deposition Calculation: (emission rate, g/s) * (deposition factor, g/ sq meter per g/s per year) / (65 kg soil/ dry cubic meter) * (30 years) * (1,000,000 ug/g), assume soil
ESL = U.S. EPA, Region 5, RCRA Ecological Screening Level (unless otherwise noted)
(A) No data available in Region 5, RCRA ESL List. This value is from the Michigan Air Toxics System Initial Risk Screening Level database. Compared to the maximum 1-hr impa

2.6 Constituents Without Benchmarks

Table 1 includes pollutants for which no ecological benchmark was found for soil or air screening concentrations. Many of these compounds are hydrocarbons (ethane, octane, and propane). Product safety assessments published by the DOW chemical company for ethane[8], propane[9], and a C5-C9 hydrocarbon blend[10] indicate that these hydrocarbons have low to moderate bioconcentration potentials and will remain in the atmosphere in a gaseous state until they are degraded by photodegradation. The remaining compounds, are 1,2,3-trimethylbenzene, acenapthylene, and benzo(e)pyrene. 1,2,3-

[8] http://www.dow.com/productsafety/pdfs/233-00682.pdf

[9] http://www.dow.com/productsafety/pdfs/233-00683.pdf

[10] http://www.dow.com/productsafety/pdfs/233-00831.pdf

trimethylbenzene meets the ESL for 1,2,4-trimethylbenzene, which has a similar chemical structure. Acenapthylene and benzo(e)pyrene are both PAH's. This project meets the ECO-SSL for PAH.

Additional compounds are missing a soil benchmark. Many of these compounds (such as methanol and hydrocarbons) will readily break down in the environment. Also, a lack of an ecological benchmark suggests that the toxicity could be so low that it is not a concern.

2.7 Non-Hazardous Air Pollutants

The Proposed Project is required to demonstrate compliance with National Ambient Air Quality Standards (NAAQS) and relevant PSD Class II Increments as part of the permitting process. This ambient analysis was submitted to Illinois EPA. The analysis shows compliance with the NAAQS and PSD Class II primary and secondary standards. The PSD permitting process also requires an additional impact analysis which identifies impacts to the environment due to emitted pollutants. The additional impact analysis discusses deposition of sulfates and nitrates, acid rain, and the accumulation of regulated NSR pollutants associated with Proposed Project. Based on the additional impact analysis, there will be no adverse effect from criteria pollutant emissions. See Appendix C for the additional impacts analysis.

3.0 SUMMARY

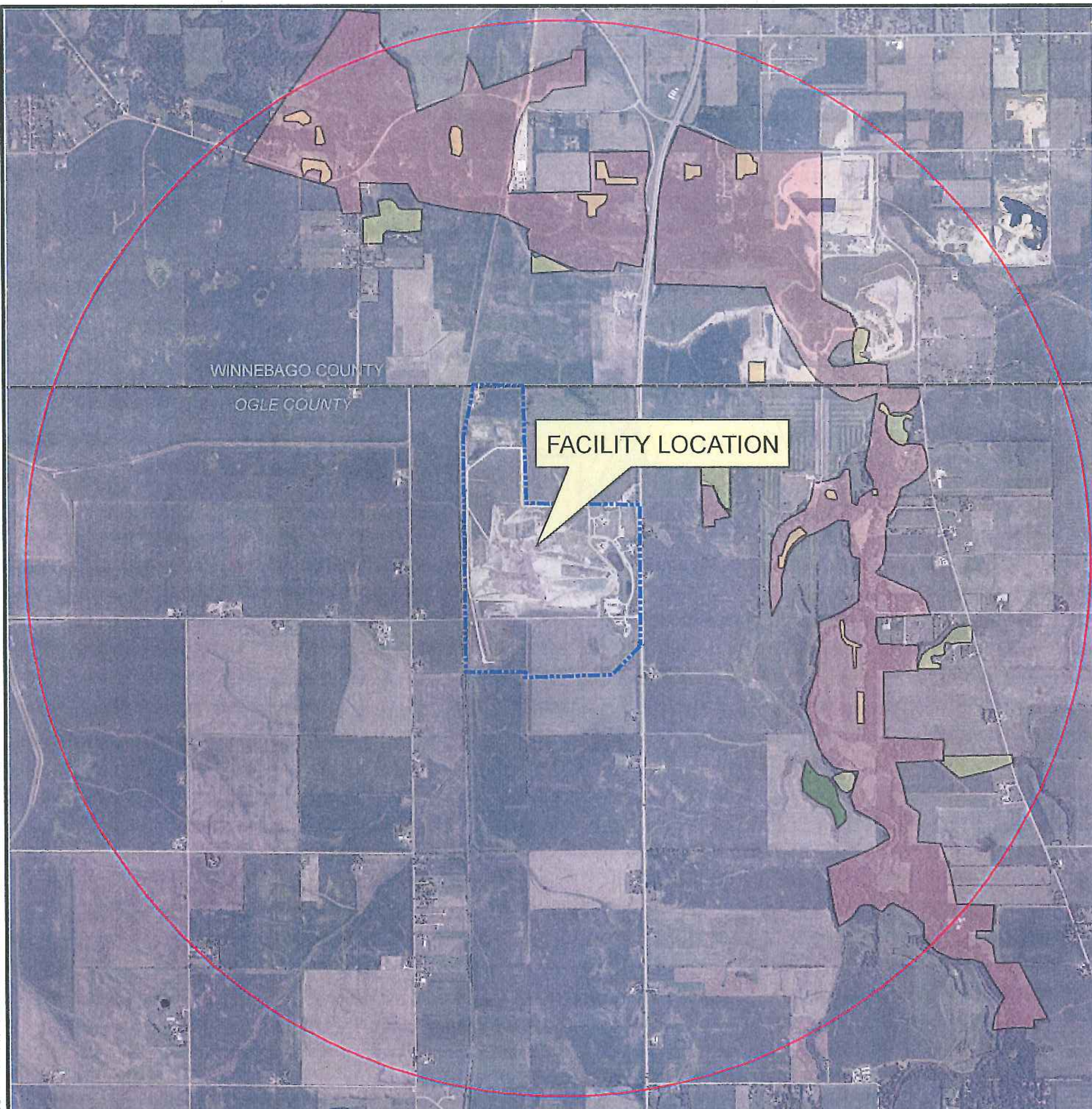
Because the impacts from this project fall below the ECO-SSLs and the RCRA ESLs, there are no identified chemicals of potential concern. Deposition and ecological risk due to criteria pollutants is addressed in the additional impacts analysis and no significant impacts are identified. Hoosier asks that the U.S. EPA concur that this project is not likely to adversely affect the Indiana Bat, the Eastern Prairie Fringed Orchid, and the Prairie Bush Clover.

GOLDER ASSOCIATES INC.

Ryan Birkenholz. P.E.
Sr. Project Engineer

Bruce A. Labno, M.S.
Senior Consultant

FIGURES



REFERENCE: NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) AERIAL IMAGERY, 2010.

LEGEND

- PROPERTY BOUNDARY
- 3_KM_RADIUS
- PRAIRIE BUSH CLOVER
- PRAIRIE BUSH CLOVER AND EASTERN PRAIRIE FRINGE ORCHID
- INDIANA BAT

0 1750 3500 7000 Feet

Golder Associates
Michigan

SCALE	AS SHOWN
DATE	5/20/11
DESIGN	KL
GIS	DJC
CHECK	
REVIEW	

FILE No. 10381277A001-GIS

PROJECT No. 103-81277 REV. 0

ENDANGERED SPECIES
VEOLIA ORCHARD HILLS LANDFILL
ROCKFORD, ILLINOIS

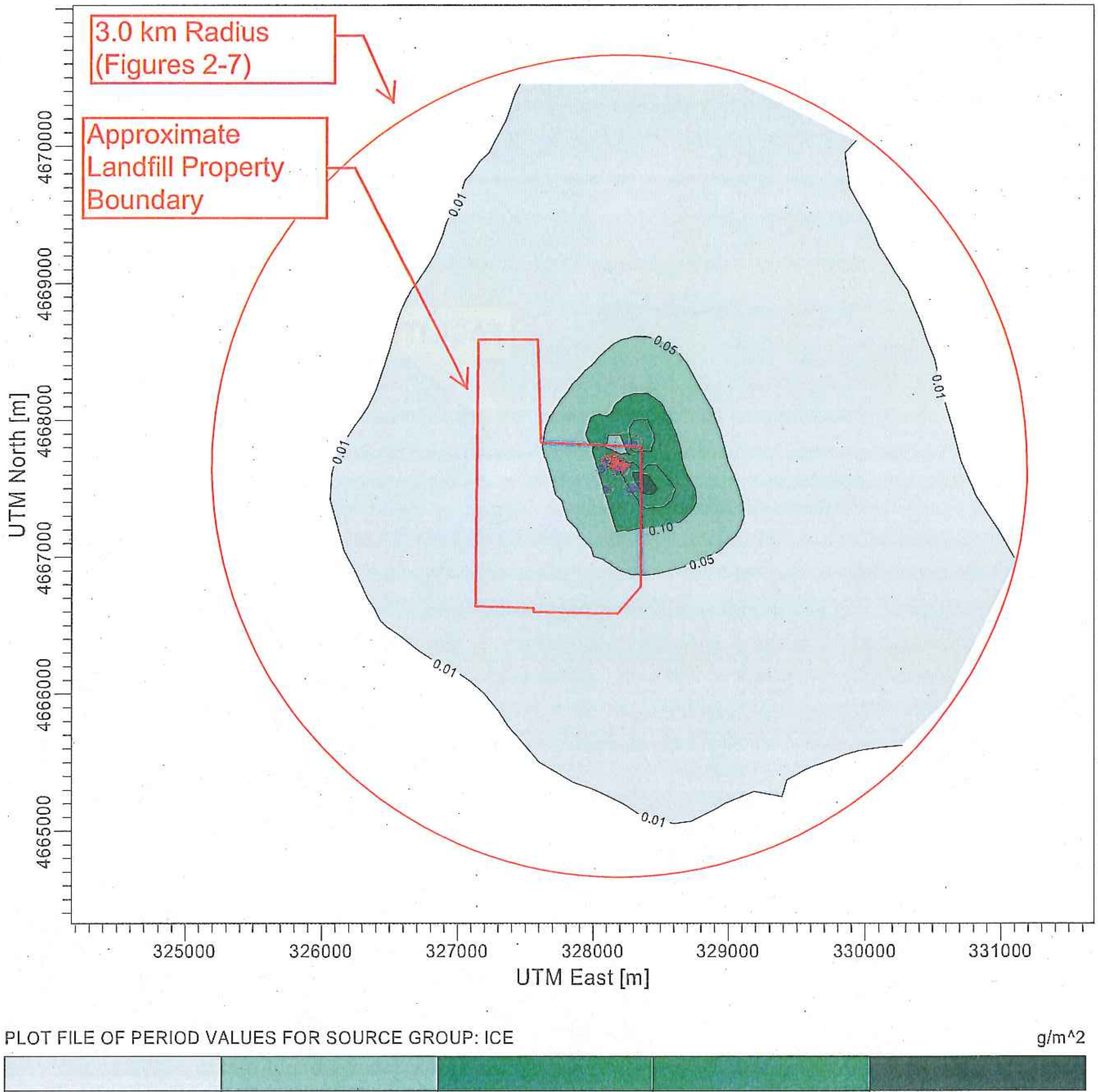
HABITAT ASSESSMENT

FIGURE 1

PROJECT TITLE:

FIGURE 2

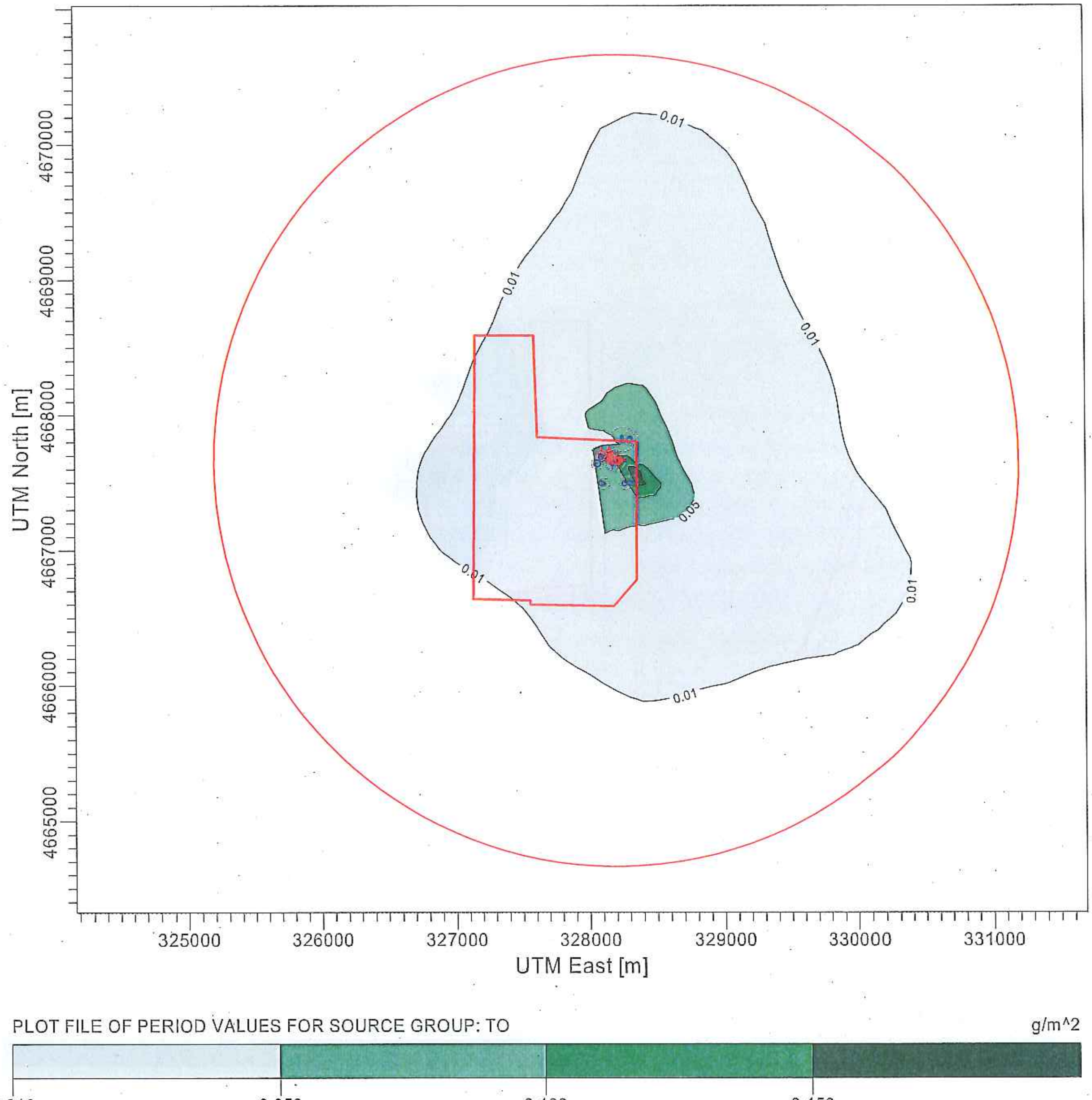
5-YR Unitized Particle Deposition Dispersion Factor (IC Engines)



COMMENTS:	SOURCES:	COMPANY NAME:	
Coordinate Datum = UTM NAD83 Zone 16N Values represent the total (wet + dry) deposition for a five year period.	**10**	**Golder Associates Inc.**	
	RECEPTORS: **3213**	MODELER: **Ryan Birkenholz, PE**	Golder Associates
	OUTPUT TYPE: **Total Depos.**	SCALE: 1:47,213 0 1 km	
	MAX: **0.24141 g/m^2**	DATE: **9/27/2011**	PROJECT NO.: **103-81277**

PROJECT TITLE:

FIGURE 3
5-YR Unitized Particle Deposition Dispersion Factor (Thermal Oxidizer)



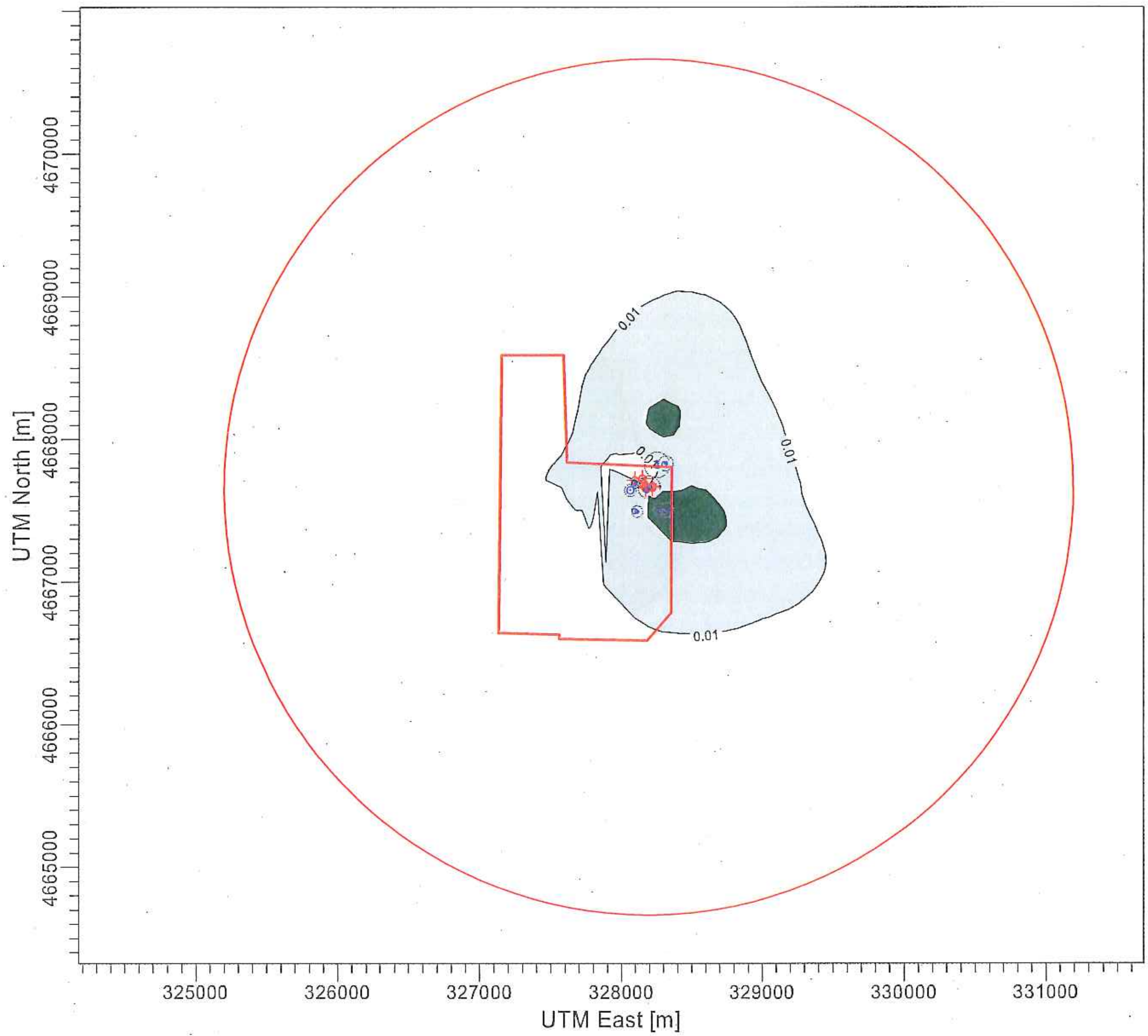
COMMENTS:	SOURCES:	COMPANY NAME:	
Coordinate Datum = UTM NAD83 Zone 16N Values represent the total (wet + dry) deposition for a five year period.	10	Golder Associates Inc.	
	RECEPTORS: 3213	MODELER: Ryan Birkenholz, PE	Golder Associates
	OUTPUT TYPE: Total Depos.	SCALE: 1:47,213 0 — 1 km	
	MAX: 0.19341 g/m^2	DATE: 9/27/2011	PROJECT NO.: 103-81277

AERMOD View - Lakes Environmental Software

C:\AERMOD_PROJECTS\103-81277 Orchard Hills\Deposition\solid\solid.isc

PROJECT TITLE:

FIGURE 4
5-YR Unitized Particle Deposition Dispersion Factor (Landfill Open Flare)



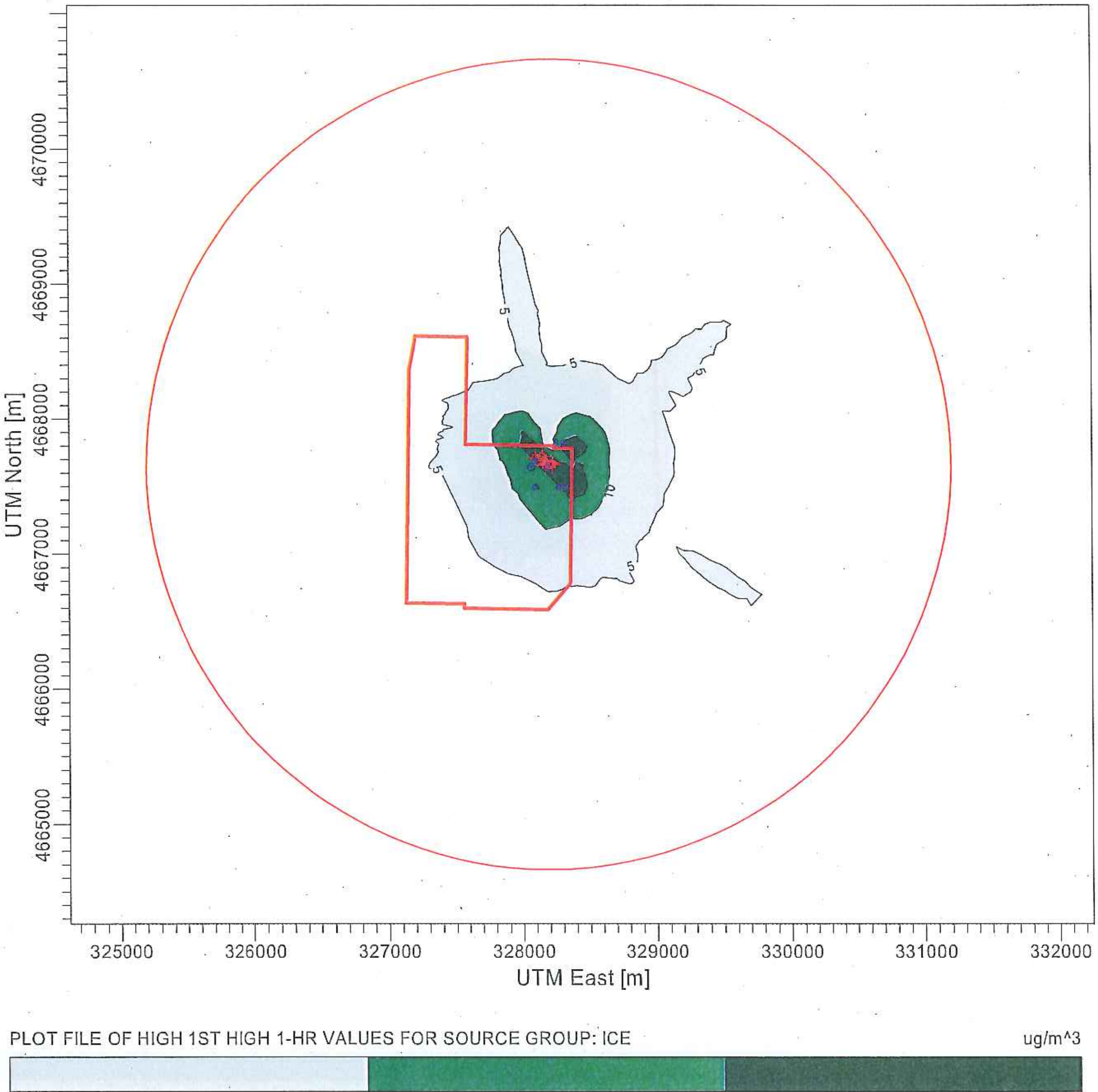
PLOT FILE OF PERIOD VALUES FOR SOURCE GROUP: LANDFILL g/m^2

0.010 0.020

COMMENTS:	SOURCES:	COMPANY NAME:	
Coordinate Datum = UTM NAD83 Zone 16N Values represent the total (wet + dry) deposition for a five year period.	**10**	**Golder Associates Inc.**	
	RECEPTORS: **3213**	MODELER: **Ryan Birkenholz, PE**	Golder Associates
	OUTPUT TYPE: **Total Depos.**	SCALE: 1:47,213 0 — 1 km	
	MAX: **0.02374 g/m^2**	DATE: **9/27/2011**	PROJECT NO.: **103-81277**

PROJECT TITLE:

FIGURE 5
1-hr Unitized Concentration Dispersion Factor (IC Engines)

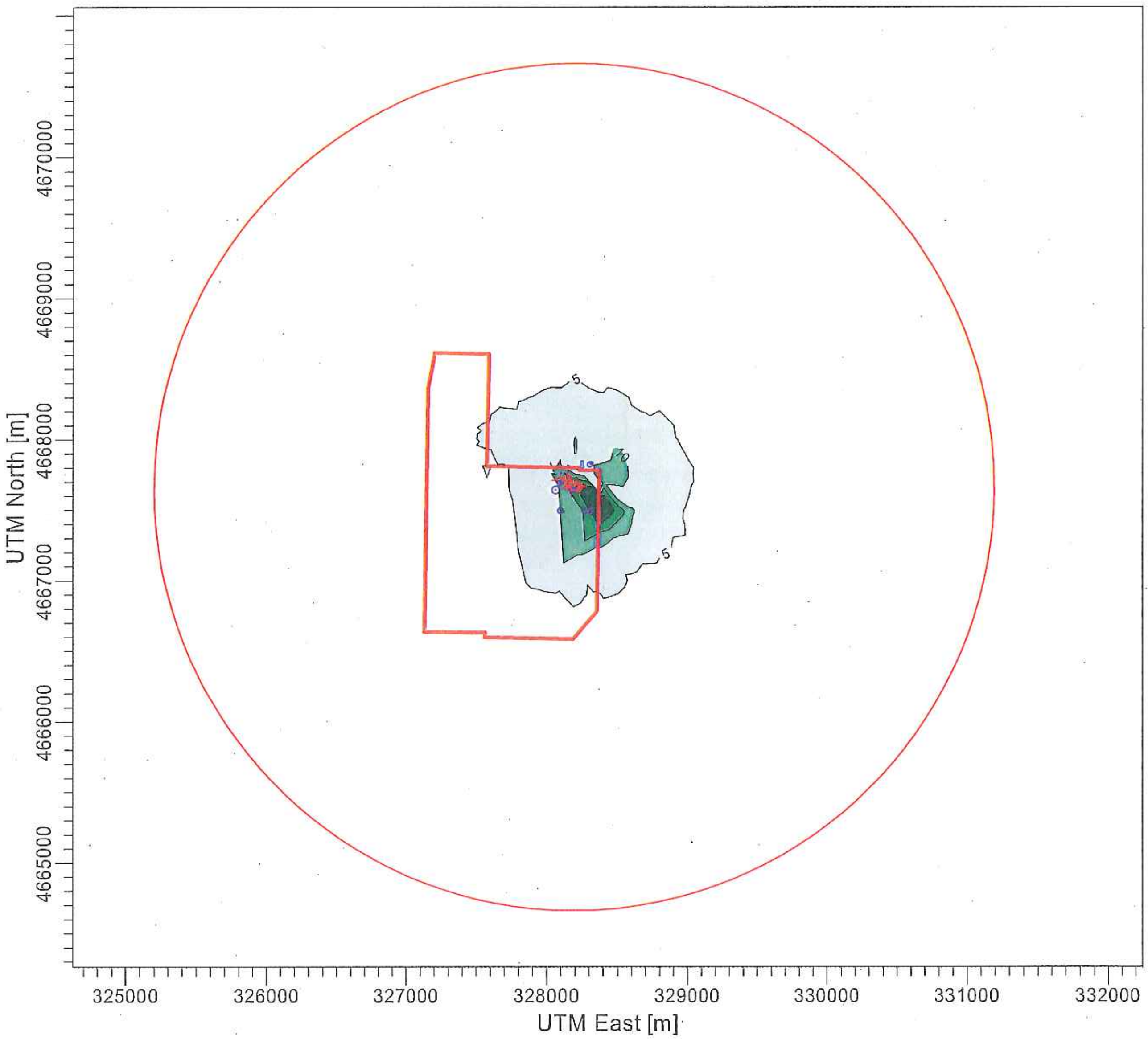


COMMENTS:	SOURCES:	COMPANY NAME:	
Coordinate Datum = UTM NAD83 Zone 16N	10	Golder Associates Inc.	
	RECEPTORS: 3213	MODELER: Ryan Birkenholz, PE	Golder Associates
	OUTPUT TYPE: Concentration	SCALE: 1:47,895 (0 — 1 km)	
	MAX: 19.60015 ug/m^3	DATE: 9/28/2011	PROJECT NO.: 103-81277

PROJECT TITLE:

FIGURE 6

1-hr Unitized Concentration Dispersion Factor (Thermal Oxidizer)



PLOT FILE OF HIGH 1ST HIGH 1-HR VALUES FOR SOURCE GROUP: TO

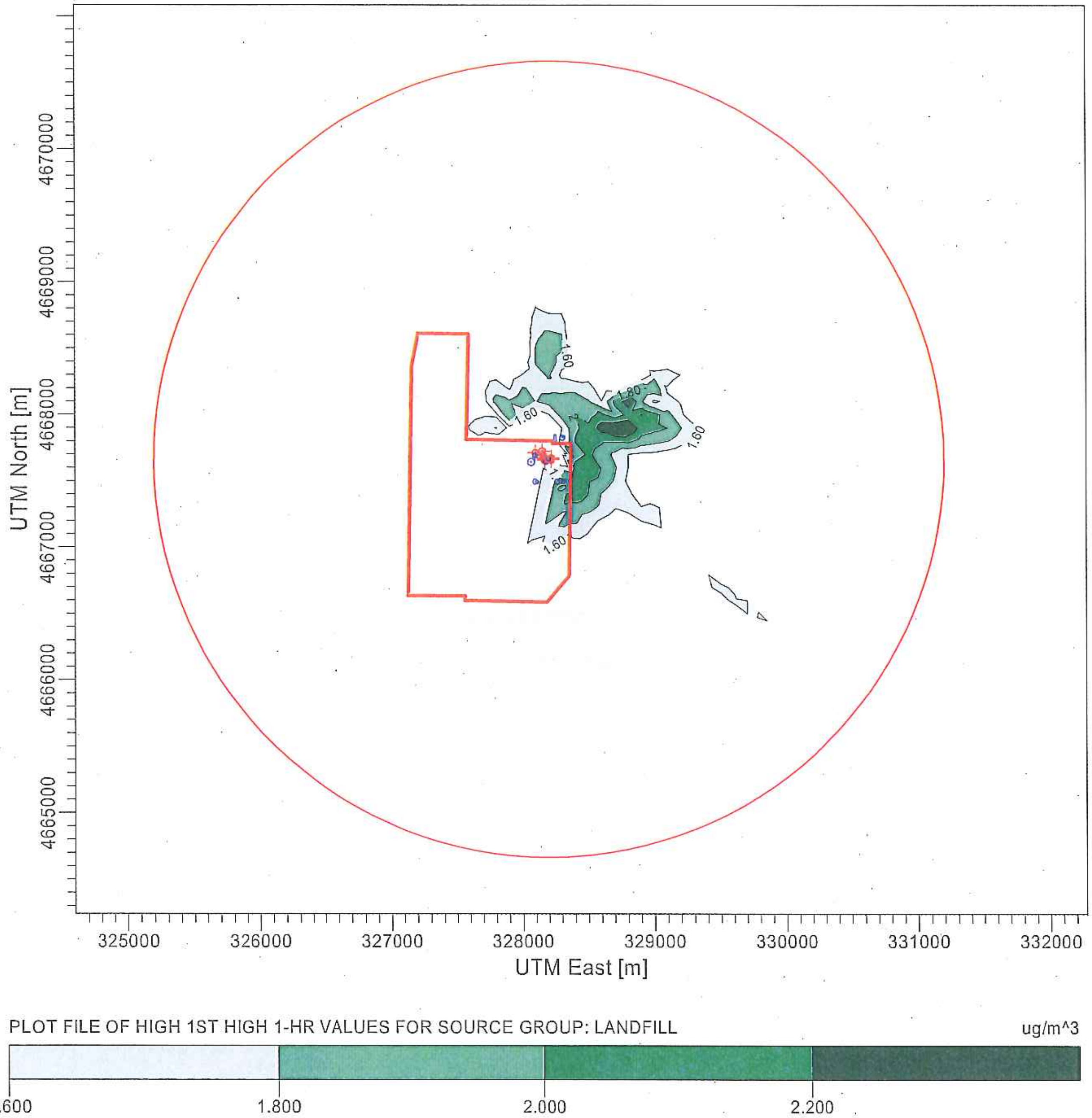
ug/m^3

5.000 | 10.000 | 15.000 | 20.000

COMMENTS: Coordinate Datum = UTM NAD83 Zone 16N	SOURCES: 10	COMPANY NAME: Golder Associates Inc.	
	RECEPTORS: 3213	MODELER: Ryan Birkenholz, PE	Golder Associates
	OUTPUT TYPE: Concentration	SCALE: 1:47,895 0 ___ 1 km	
	MAX: 31.10374 ug/m^3	DATE: 9/28/2011	PROJECT NO.: 103-81277

PROJECT TITLE:

FIGURE 7
1-hr Unitized Concentration Dispersion Factor (Landfill Open Flare)



COMMENTS:	SOURCES:	COMPANY NAME:	
Coordinate Datum = UTM NAD83 Zone 16N	10	Golder Associates Inc.	
	RECEPTORS: 3213	MODELER: Ryan Birkenholz, PE	Golder Associates
	OUTPUT TYPE: Concentration	SCALE: 1:48,232 (0 — 1 km)	
	MAX: 2.54529 ug/m^3	DATE: 9/28/2011	PROJECT NO.: 103-81277

APPENDIX A
SCOPE OF ANALYSIS

Recommended Scope of Analysis
for Endangered Species Evaluation

Purpose of analysis:

The analysis is intended to determine whether the proposed modifications are likely to directly or indirectly adversely affect federally listed species. This recommended scope of analysis or roadmap recommends using USEPA's ecological risk assessment process to inform the decision points in section 7 of the Endangered Species Act. Portions of the USEPA's draft Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities (EPA 530-D-99-001A) provides useful guidance for this analysis. Although this guidance was designed specifically to assess the impact of hazardous waste combustion facilities, it offers general approaches for assessing the fate of chemicals released to the air that can be applied to all types of industrial facilities.

Overall, the evaluation should focus on increased emissions from the facility. To complete this analysis we need an understanding of the background concentrations and deposition patterns. The anticipated emissions from permitted but not yet operational facilities should be included in background. The anticipated concentration in air or deposition at sites supporting listed species should be compared against NOEL (No observed effects level) benchmarks thought to be protective of the appropriate group (e.g., plants). The evaluation should look at the incremental addition in the context of background concentrations.

Benchmarks:

For these analyses, commonly accepted NOEL (no observed effects levels) benchmarks should be used. Where more than one benchmark can be found the most conservative value should be used, unless an explanation is given to justify a less conservative benchmark. When there is no commonly accepted benchmark, there should be a search of the scientific literature for relevant toxicity information to provide a basis for risk assessment for the species of concern.

Modeling protocol:

Modeling should follow the general guidance provided in Chapter 3 of USEPA's SLERA protocol for assessing chemical fate and transport. The modeling should show air concentrations and deposition rates for all pollutants (where appropriate). The air emissions resulting from the project should be modeled at the facility level, not on a unit basis. Total impacts should be evaluated looking at the combined effects of the vapor phase, particle phase and particle-bound phase of pollutants. ISCST3 or AERMOD are acceptable models for this analysis. For chemicals amenable to deposition, models in the SLERA guidance should be used to estimate concentrations in soil, sediment and surface water in conjunction with relevant fate and transport parameters.

Assessment Area:

For the chemicals amenable to deposition, the majority should deposit within a 3 km radius of the facility. We recommend using the maximum deposition value within that 3 km radius in performing the analysis.

Background Levels:

Background levels of pollutants of concern should be located for soil, water and sediment. If actual values cannot be located, representative values may be used.

Suite of pollutants to consider:

The assessment should cover all air pollutants emitted from the facility including ozone, sulfur compounds, oxides of nitrogen, carbon monoxide, particulates, and hazardous air pollutants. USEPA will provide the analysis for ozone for this project.

Types of impact to consider:

1. Short term, depending on pollutant compare worst 1 hr, 8 hr, and 24 hr. concentration in air with appropriate bench marks for acute effects. A discussion of each pathway should be included with an explanation of which is considered most sensitive. This includes, but is not limited to, impact to physical structures, cuticle uptake, stomatal uptake, root uptake, and particulate clogging of stomates for plant species. For the bald eagle and the Inidana bat determine the exposure to via food sources that would be taking up contaminants through soil, water and sediment.
2. Long term, depending upon pollutant compare worst 1 yr of 5 concentration in air or deposition on soil with appropriate bench marks for chronic effects.
3. For compounds that may accumulate, evaluate estimated total deposition over life of project. These concentrations should be compared against benchmarks.

The facility may rely on GIS data to exclude certain species from the analysis. The eastern prairie fringed orchid would most likely be associated with wet meadows or wet prairies not in a stream or river floodplain; however, it may also occur on mesic prairie habitat. We suggest using the National Wetlands Inventory (NWI) and the Land Use and Land Cover map to determine if suitable habitat is present. The NWI code that best illustrates the wet prairie habitat would be the PEM series outside of the 100 year floodplain. On the Land Use and Land Cover maps, look for nonagricultural grassland.

To rule out the prairie bush clover use the Land Use and Land Cover map. Look for nonagricultural grasslands. If there are none, than the prairie bush clover can be excluded.

To rule out the Indiana Bat, look for grassy field, stream corridors and forested, non-developed areas. If there are none, then the Indiana Bat may be ruled out.

APPENDIX B

ELECTRONIC SUBMITTAL SUBMITTED ON ENCLOSED COMPACT DISK

- BPIP INPUT/OUTPUT FILES
- MET DATA FILES
- DIGITAL ELEVATION DATA
- DISPERSION MODEL INPUT/OUTPUT FILES

APPENDIX C

PSD ADDITIONAL IMPACTS ASSESSMENT

ADDITIONAL IMPACTS ANALYSIS

Hoosier Energy REC, Inc.

Landfill Gas to Energy Project in Davis Junction

Submitted To: Hoosier Energy REC, Inc.
7398 N. State Road 37
PO Box 908
Bloomington, IN 47402

Submitted By: Golder Associates Inc.
1751 W. County Road B, Suite 105
Roseville, MN 55113 USA

Distribution: Hoosier Energy REC, Inc.
Golder Associates Inc.

October 2011

Project No. 103-81277

A world of capabilities delivered locally

Golder Associates

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1.0 INTRODUCTION

Golder Associates Inc. (Golder) performed an additional impacts analysis for the proposed Landfill Gas to Energy Facility in Davis Junction (Proposed Project) owned and operated by Hoosier Energy REC, Inc (Hoosier). This additional impacts analysis is part of the Prevention of Significant Deterioration (PSD)/construction permit application that will authorize the installation of the following emission units:

- Seven 3,764 bhp reciprocating internal combustion engines driving electrical generators that will generate electricity up to 8,760 hours per year.
- One thermal oxidizer that will destroy offgas from the siloxane removal system that can operate up to 8,760 hours per year.

The following processes will also occur, but are either insignificant or do not emit regulated air pollutants:

- Siloxane removal system
- Sulfur treatment system
- Enclosed landfill gas particulate filters
- Landfill gas blowers
- Landfill gas dehydration systems
- New and waste oil storage tanks

This Proposed Project will purchase the landfill gas from the Veolia ES Landfill (Landfill) and combust it in the engines to generate electricity for sale to the grid.

This Proposed Project and the Landfill are considered the same source for air permitting purposes; however Hoosier is requesting that a separate permit be issued for this Proposed Project. See Figure 1 for the Proposed Project location. The Proposed Project is a major source under PSD for CO, NOx, VOC, PM, PM10, and PM2.5.

This additional impacts analysis contains the following:

- Growth Analysis
- Ambient Air Quality Analysis
- Soils and Vegetation Analysis
- Visibility Analysis
- Biological Assessment

A Class I analysis is not required for this Proposed Project because it is located greater than 300 km from the nearest Class I area, which is the Seney National Wildlife Refuge in Michigan.

2.0 ADDITIONAL IMPACTS ANALYSIS

2.1 Growth Analysis

The Proposed Project is not expected to have a significant impact on industrial, commercial, and residential growth in the area. The Proposed Project has a building footprint of approximately 16,000 square feet. The Landfill where the gas is to be piped from is already established. The landfill gas is being piped so there will be minimal increases in truck traffic to the Proposed Project. Construction of the Proposed Project will require a work force of approximately 20 people over the duration of the construction period. Construction jobs are anticipated to be filled by workers commuting to the site from the surrounding area. The Proposed Project is anticipated to employ less than ten people locally. The Proposed Project will not have a significant effect on residential, commercial, or industrial growth.

2.2 Ambient Air Quality Analysis

The Proposed Project does not cause or contribute to an exceedance of a national ambient air quality standard and meets the prevention of significant deterioration Class II increments. A detailed analysis has been submitted in a separate report.

The following analysis on soils and vegetation is based on running an AERMOD deposition model. Table 2.2 shows the maximum wet and dry deposition impacts from the Proposed Project. Figures 2 and 3 show the deposition pattern surrounding the Proposed Project.

TABLE 2.2 - DEPOSITION FROM UNITIZED PARTICLE DEPOSITION FACTORS (PDFs)

NO_2 DEPOSITION (TOTAL)

	1-hr PDF (g/sq m per g/s)	Emission Rate (g/s)	Impact (g/sq m)	8-hr PDF (g/sq m per g/s)	Emission Rate (g/s)	Impact (g/sq m)	24-hr PDF (g/sq m per g/s)	Emission Rate (g/s)	Impact (g/sq m)	5YR PDF (g/sq m per g/s)	Emission Rate (g/s)	Impact (g/sq m)
ICE	0.00055	4.39000	0.00241	0.00205	4.39000	0.00900	0.00209	4.39000	0.00918	0.24136	4.39000	1.05957
TO	0.00050	0.13900	0.00007	0.00219	0.13900	0.00030	0.00237	0.13900	0.00033	0.19337	0.13900	0.02688
FLARE	0.00009	0.81400	0.00007	0.00045	0.81400	0.00037	0.00047	0.81400	0.00038	0.02372	0.81400	0.01931
			0.00256			0.00967			0.00989			1.10576

SO_2 DEPOSITION (TOTAL)

	1-hr PDF (g/sq m per g/s)	Emission Rate (g/s)	Impact (g/sq m)	8-hr PDF (g/sq m per g/s)	Emission Rate (g/s)	Impact (g/sq m)	24-hr PDF (g/sq m per g/s)	Emission Rate (g/s)	Impact (g/sq m)	5YR PDF (g/sq m per g/s)	Emission Rate (g/s)	Impact (g/sq m)
ICE	0.00055	1.06100	0.00058	0.00205	1.06100	0.00218	0.00209	1.06100	0.00222	0.24136	1.06100	0.25608
TO	0.00050	0.08800	0.00004	0.00219	0.08800	0.00019	0.00237	0.08800	0.00021	0.19337	0.08800	0.01702
FLARE	0.00009	4.94700	0.00045	0.00045	4.94700	0.00223	0.00047	4.94700	0.00233	0.02372	4.94700	0.11734
			0.00107			0.00459			0.00475			0.39044

EXPLICIT NO_2 AND SO_2 DEPOSITION MODEL RESULTS

EXPLICIT NO_2 DEPOSITION MODEL (5 YEARS)

	Wet Deposition (g/m2)	Dry Deposition (g/m2)	Total Deposition (g/m2)	
ALL	0.0011	1.1042	1.1045	Five Year Deposition Rate
ALL	0.0002	0.2208	0.2209	In units of g/m2 per year as NO_2
ALL	0.0022	2.2085	2.2090	In units of kg/hectare per year as NO_2

Multiply by 1.35 to obtain NO_3
Multiply by 0.30 to obtain Nitrogen

EXPLICIT SO_2 DEPOSITION MODEL (5 YEARS)

	Wet Deposition (g/m2)	Dry Deposition (g/m2)	Total Deposition (g/m2)	
ALL	0.0016	0.3848	0.3850	Five Year Deposition Rate
ALL	0.0003	0.0770	0.0770	In units of g/m2 per year as SO_2
ALL	0.0032	0.7695	0.7699	In units of kg/hectare per year as SO_2

Multiply by 1.25 to obtain SO_3
Multiply by 1.50 to obtain SO_4
Multiply by 0.50 to obtain Sulfur

ICE = Seven Internal Combustion Engines
TO = Thermal Oxidizer
FLARE = Landfill Flare
ALL = ICE + TO + FLARE

2.3 Soils and Vegetation Analysis

The soils and vegetation analysis discusses the following four major topics based on guidance from the IEPA:

- Nitrogen deposition or "nutrient enrichment" and its effect on plant community composition and the local ecology
- Possible adverse affects from acid rain and soil acidification when considering deposition of nitrogen and sulfur species.
- An overall evaluation of direct foliar damage and potential phototoxic effects from ambient air concentrations
- An evaluation of the soils accumulation of regulated NSR pollutants, particular attention to possible plant uptake and potential adverse effects (reduced plant growth and crop yields, impaired photosynthesis, interference with biochemical pathways, etc.)

2.3.1 Nitrogen Deposition

Wet and dry nitrogen deposition was analyzed for the entire significant impact area (SIA) defined by the area that experiences an impact above the significant impact level (SIL) for 1-hr NO_2 which has a numerical value of 7.55 μg/m³. A significant portion of the SIA is either undeveloped land or is used for planting row crops such as corn and soybeans.

Areas under cultivation often create a deficiency of nitrogen in soil which can be minimized with conservation tillage, crop rotation and other agricultural practices. The addition of nitrogen is often required to maximize crop production. Studies by researchers from the University of Illinois, Department of Crop Science[1] indicate that corn after corn production requires nitrogen fertilizer application rates of at least 100 lbs of N per acre to maximize corn yields even with crop residue management. Nitrogen application rates will vary from year to year based on the previous year's crops and agricultural practices applied. The Iowa State University Extension[2] notes nitrogen application rates can vary from 0 to 75 lbs of N per acre based on whether the previous year's crops were alfalfa or soybeans with or without manure. Nitrogen application rates are determined by soil analyses conducted prior to planting and the proposed crop to be planted.

Using the AERMOD particle dry deposition analysis, the NO_2 the maximum dry deposition rate for the Proposed Project is 1.10 g NO_2 per square meter over a 5 year period (see Table 2.2). This is equivalent

[1] http://frec.cropsci.illinois.edu/2010/report6/

[2] Iowa State University, University Extension, Pm-1714, May 1997

to 0.6 lb nitrogen per acre per year[3], which is approximately 0.6% of a corn after corn fertilizer application rate of 100 lbs of N per acre. Even with limited nitrogen soil requirements, any nitrogen deposited from the Proposed Project will be biologically assimilated. The impacts due to nitrogen deposition will be insignificant. Figure 2 shows the total NO_2 deposition rates surrounding the Proposed Project.

2.3.2 Acid Rain and Soil Acidification

The Proposed Project will have a wet deposition component from nitrogen oxides and sulfur dioxide. Nitrogen oxides can react with hydroxyl radicals and water in the atmosphere to form nitric acid which can fall as nitric acid rain. Sulfur dioxide can react with hydroxyl radicals to form sulfur trioxide, which further reacts with water to produce sulfuric acid which can fall as sulfuric acid rain.

Acid rain data is collected by the National Trends Network (NTN) of the National Atmospheric Deposition Program (NADP). The NTN has 250 stations measuring wet deposition of various anions and cations including the primary components of acid rain: nitrates and sulfates. One of the network stations is located at the University of Illinois - State Agriculture Experiment Station near DeKalb[4] (the Shabbona station, IL18), approximately 24 miles southeast of the Proposed Project. Annual nitrate and sulfate wet deposition rates were obtained from the Shabbona station for the same years used in the AERMOD modeling (2005-2009). See Table 2.3.2.

[3] (1.1 g NO_2 /sq m in 5 years) * (1 lb/453.59 g) *(4047 sq m/acre) * (14 g N/mol) / (46 g NO_2 /mol) / (5 years)

[4] http://nadp.sws.uiuc.edu/ntn/

TABLE 2.3.2 - National Atmospheric Deposition Program/NTN Data, Annual Deposition

Illinois Agriculture Extension Station, DeKalb (Shabbona)

Site ID	Summary Period	Year					Totals		Days	Dates	
			NH_4	NO_3	Inorganic N	SO_4	Sample Vol. (ml)	Precip(cm)			
IL18	Annual	2000	3.77	12.02	5.64	12.56	47,636	75.64	371	12/28/1999	1/2/2001
IL18	Annual	2001	3.32	11.05	5.08	12.24	48,492	73.41	365	1/2/2001	1/2/2002
IL18	Annual	2002	3	9.68	4.52	9.72	42,315	65.69	363	1/2/2002	12/31/2002
IL18	Annual	2003	4.24	10.64	5.7	12.4	44,733	70.43	364	12/31/2002	12/30/2003
IL18	Annual	2004	3.75	9.79	5.12	11.53	52,134	78.87	364	12/30/2003	12/28/2004
IL18	Annual	2005	2.95	8.34	4.18	9.71	32,441	52.24	371	12/28/2004	1/3/2006
IL18	Annual	2006	5.03	11.92	6.6	14.72	53,682	80.46	364	1/3/2006	1/2/2007
IL18	Annual	2007	6.2	13.61	7.89	14.59	70,170	110.25	364	1/2/2007	1/1/2008
IL18	Annual	2008	4.53	10.17	5.82	13.19	70,073	112.68	364	1/1/2008	12/30/2008
IL18	Annual	2009	5.55	10.69	6.73	11.76	68,299	100.48	364	12/30/2008	12/29/2009
			5 Year Average Depostion	10.946		12.794					
			VOH Project % of Annual Deposition	0.03%		0.04%					

Max Annual Wet Deposition:	NO_3=	0.00297	kg/ha	AERMOD Deposition Model
	SO_4=	0.0048	kg/ha	AERMOD Deposition Model

	NO_3	SO_4	Source
Annual Wet Deposition =	0.00022 g NO_2 / m^2	0.00032 g SO_2 /m^2	AERMOD Deposition Model
	10,000 m^2/ha	10,000 m^2 /ha	Conversion
	1.35 Conversion to NO_3	1.5 Conversion to SO_4	Conversion
	2.97 g NO_3/ha/yr	4.8 g SO_4 /ha/yr	Conversion
	0.00297 kg NO_3/ha/yr	0.0048 kg SO_4 /ha/yr	Conversion
Annual Dry Deposition =	0.2208 g NO_2 /m^2		AERMOD Deposition Model
	10,000 m^2 /ha		Conversion
	0.3043 Conversion to Nitrogen (N)		Conversion
	672.04 g N/ha/yr		Conversion
	0.67 kg N/ha/yr		Conversion
Total Dry Deposition (as N)=	0.5996 lbs N/ac/yr		Conversion

Nitric Acid Rain

Using the AERMOD wet particle deposition analysis for NO_2, the maximum wet deposition rate for the Proposed Project is 0.0011 g NO_2 per square meter over a 5 year period. This is equivalent to 0.00297 kg of NO_3 per hectare per year (kg/ha). The 5-year average NO_3 deposition rate measured at the Shabbona station is 10.946 kg/ha. The Proposed Project contribution to the acid rain deposition is less than 0.1% In addition the soils in the vicinity of the Proposed Project have a pH in the range of 5.9 to 7.9 which indicates that the soils have the capacity to neutralize nitric acid rain.

Sulfuric Acid Rain

The Proposed Project will significantly reduce the amount of sulfur oxides being emitted from the landfill operation. Currently, the landfill gas is being combusted in one of two flares with minimal reduction in sulfur prior to combustion. The Proposed Project will use a high efficiency biological sulfur reduction system that will reduce landfill gas sulfur to less than 140 ppmv prior to combustion on a continuous basis. The sulfur compounds removed from the landfill gas are in a semi solid form and will not be emitted to the atmosphere. Any impacts on the surrounding soils due to sulfur would be greatly reduced from the current impact due to landfill gas combustion in the existing flares.

Using the AERMOD wet particle deposition analysis for SO_2, the maximum wet deposition rate for the Proposed Project is 0.0016 g SO_2 per square meter over a 5-year period. This is equivalent to 0.0048 kg of SO_4 per hectare per year (kg/ha). The 5-year average SO_4 deposition rate measured at the Shabbona station is 12.794 kg/ha. The Proposed Project contribution to the acid rain deposition is less than 0.1% In addition the soils in the vicinity of the Proposed Project have a pH in the range of 5.9 to 7.9 which indicates that the soils have the capacity to neutralize sulfuric acid rain where it can be biologically assimilated by vegetation. No significant effect will take place with soil acidification with this rate of deposition. Figure 3 shows total SO_2 deposition rates surrounding the Proposed Project.

2.3.3 Direct Foliar Damage and Potential Phytotoxic Effects

The effects of nitrate and sulfate wet deposition as acid rain from the Proposed Project are less than 0.1% of the incident precipitation recorded at the Shabbona state (see Section 2.3.2). This means the Proposed Project will not change or adversely affect the pH of rain events in the area.

2.3.4 Soils Accumulation of Regulated NSR Pollutants

The Proposed Project will emit the following regulated NSR Pollutants:

- NOx
- CO
- SO_2
- PM/PM10/PM2.5
- Greenhouse Gasses
- Hazardous Air Pollutants (HAPs)

The maximum total NOx deposition is estimated to be 1.1 grams per square meter expressed as NO_2. At this rate, any nitrogen compounds deposited into the soil will be rapidly consumed by vegetation as fertilizer and no buildup of nitrogen is expected. See Section 2.3.1 for further discussion.

CO converts primarily to CO_2 in the atmosphere, which is discussed below. It is not expected that CO will buildup in the soil.

SO_2 can be deposited as sulfates after secondary reaction in the atmosphere (dry deposition) or by the formation of sulfuric acid which is deposited as sulfuric acid rain (wet deposition). AERMOD shows that the maximum SO_2 wet and dry deposition will be 0.38 grams per square meter. At rates this low, any sulfur that is deposited will not accumulate to a level that will change the pH of the soil and most likely will be converted to other compounds by bacteria and other physical-chemical processes that might aid in micronutrient uptake by plants[5].

PM/PM10/PM2.5 deposition will be primarily carbon particulates with trace metals. Deposition models were not run to determine these impacts; however, Proposed Project will not increase the amount of trace metals that will be deposited because these metals are already being emitted by the existing flares at the Landfill. See Appendix C for details on ecological risks.

Greenhouse gas is composed mostly of carbon dioxide, which can react in the atmosphere to form carbonic acid and fall as acid rain. The Proposed Project will not significantly increase the amount of greenhouse gas being generated because the landfill gas is already being combusted in the existing flares at the Landfill. Because the total GHG emission is not significantly changing, the Proposed Project will not cause an increase in the accumulation of carbon in the soils.

[5] http://www.agronext.iastate.edu/soilfertility/info/NWRF_AnnRepo1999_Sulfur_Publ-2000.pdf

HAP emissions include trace metals and organic HAP. Trace metals are typically adsorbed onto particulate matter and emitted as PM/PM10/PM2.5. Organic HAP is typically emitted directly to the atmosphere rather than adsorbed onto particulate matter. The only significant HAP increase from the Proposed Project is formaldehyde. Formaldehyde is can be generated in greater quantities in internal combustion engines than in open or enclosed flares. Formaldehyde is readily soluble in water and can be absorbed in to the upper levels of the soils; however, formaldehyde is readily biodegraded in the environment within hours/days of deposition[6].

In summary, none of the emitted regulated NSR pollutants discussed above will accumulate in the surrounding soils at levels that could be considered harmful.

2.4 Visibility Analysis

The Proposed Project is not expected to have a significant impact on visibility due to plume opacity. The applicant performed a screening visibility analysis using VISCREEN, a tool developed by the U.S. EPA for determining visual impacts for Class I areas. Although the Proposed Project will not impact a Class I area, the VISCREEN model was used to show that the plume will not cause a significant visibility issue at the nearest park (Seth Atwood Park, located 8 km NE of Proposed Project) for the residents of Davis Junction, IL. The following source parameters were used in the VISCREEN model:

- Emission Rates
  - Particulate = 0.76 g/s
  - NOx (as NO_2) = 4.53 g/s
  - Primary NO_2 = 0 g/s
  - Soot = 0 g/s
  - Primary SO_4 = 0 g/s
- Particle Characteristics
  - Primary Particulate = Default
  - Soot = Default
  - Sulfate = Default
- Transport Scenario Specifications
  - Background Ozone = 0.069 ppm (background provided by Illinois EPA, 1-hr basis)
  - Background Visual Range = 25 km (Figure 9, Workbook for Plume Visual Impact Screening Analysis, October 1992)
  - Source-Observer Distance = 4.3 km (approximate distance from Davis Junction, IL to Proposed Project)
  - Min Source Distance = 8.0 km (approximate distance from Proposed Project to nearest point in park)

[6] Toxicological Profile for Formaldehyde, U.S. Department of Health and Human Services, July 1999

- Max Source Distance = 9.0 km (approximate distance from Proposed Project to furthest point in park)
- Plume Source Observer Angle = Default (11.25°)
- Stability Class = 3
- Wind Speed = 3.91 m/s (annual average of MET data set)

Using the inputs listed above, the VISCREEN model does not predict any exceedances of Class I screening criteria and therefore will not cause a significantly impact visibility. See Appendix A for model output and summary files.

2.5 Biological Assessment

The Illinois Department of Natural Resources (DNR) was contacted regarding state listed endangered and threatened species. The DNR provided the results of an Illinois Natural Heritage Database search dated April 12, 2011. Both Ogle and Winnebago Counties are located within 3.0 km of this Proposed Project. The Database lists 42 species in Ogle County and 52 species in Winnebago County that are listed as either threatened or endangered and were last observed between 1957 and present time (see Appendix B). The federal Endangered Species Act requires the Proposed Project to assess its ecological risk to federally listed endangered and threatened species. This assessment is presented in Appendix C. The assessment demonstrates that the Proposed Project's ambient impacts and pollutant deposition are below air and soil ecological screening benchmarks and that there will be no adverse ecological risk to threatened or endangered species due to the Proposed Project.

3.0 SUMMARY

The analysis presented in report shows that the Proposed Project will not likely to adversely affect the surrounding ecology and environment. This conclusion is based on the analyses presented here and in the *Ecological Risk Assessment for Federal Endangered/Threatened Species* required by US EPA (Appendix C). In both reports, the potential impacts of emissions from the Proposed Project are less than published thresholds for health and ecological damage.

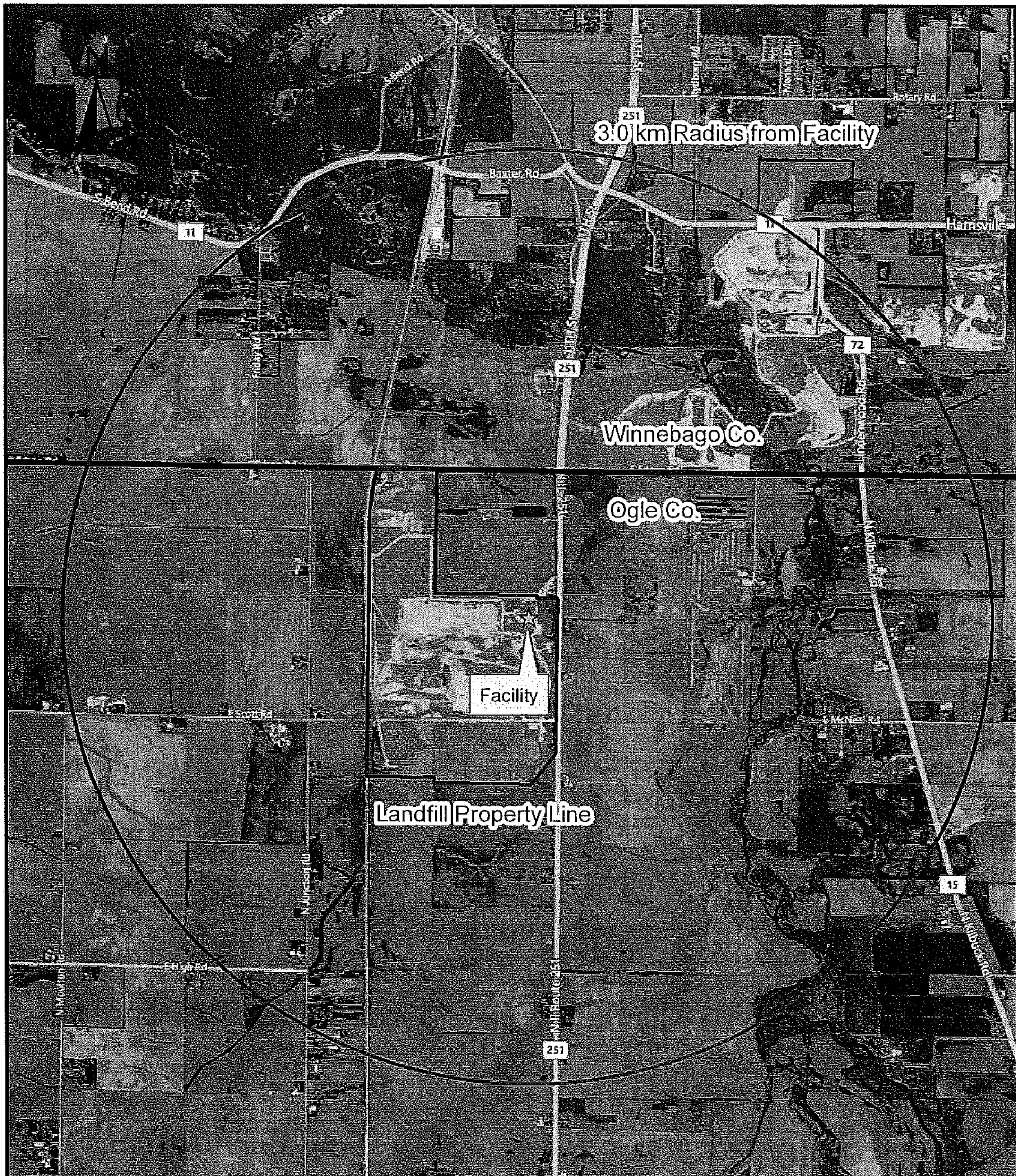
Hoosier Energy asks that the air permit be issued for the Proposed Project.

GOLDER ASSOCIATES INC.

Ryan Birkenholz. P.E.
Sr. Project Engineer

Bruce A. Labno, M.S.
Senior Consultant

FIGURES



REFERENCE

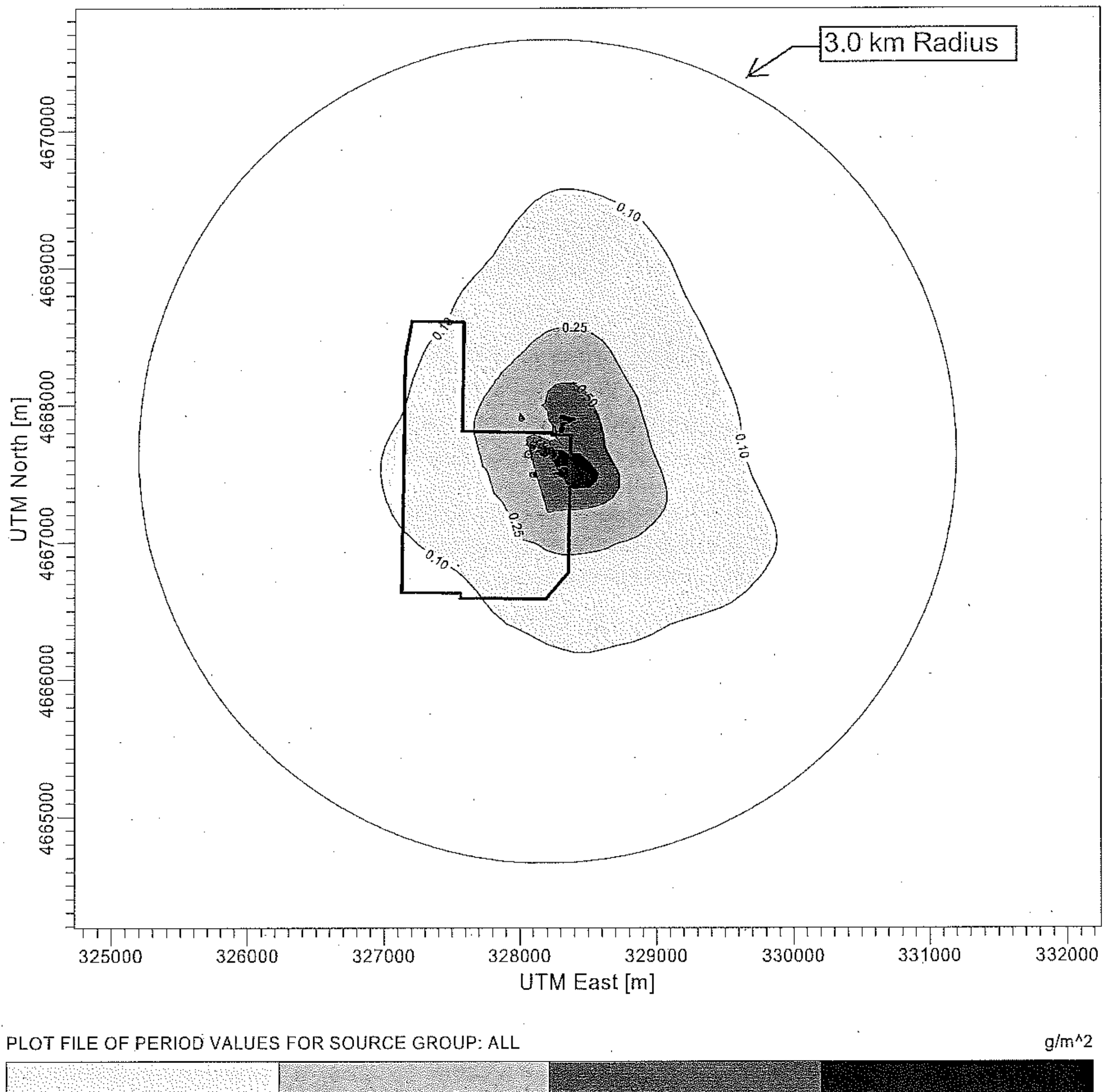
BASEMAP: Bing Hybrid Basemap, ArcGIS

Golder Associates, Minneapolis, MN	DATE SEP 28, 2011	TITLE	
	DESIGN RCB	**Site Location**	
	GIS RCB		
PROJECT No. 103-81260	CHECK		
SCALE As Indicated · REV. 0	REVIEW	PROJECT Veolia Gas to Energy Facility in Davis Junction	**FIGURE: 1**

Project: ...MyProject.mxd? - Plot: ...MyProject.pdf?

PROJECT TITLE:

FIGURE 2
Total NO2 Deposition Over a 5 Year Period (2005-2009)



COMMENTS:	SOURCES:	COMPANY NAME:	
Coordinate Datum = UTM NAD83 Zone 16N Values represent the total (wet + dry) nitrogen dioxide deposition for a five year period. Multiply by 0.3043 g N/gNO2 to obtain grams of Nitrogen per square meter. Wet Deposition is approximately 0.1% of total deposition.	**10**	**Golder Associates Inc.**	
	RECEPTORS: **4200**	MODELER: **Ryan Birkenholz, PE**	Golder Associates
	OUTPUT TYPE: **Total Depos.**	SCALE: 1:47,216 (0 — 1 km)	
	MAX: **1.10451 g/m^2**	DATE: **9/28/2011**	PROJECT NO.: **103-81277**

PROJECT TITLE:

FIGURE 3
Total SO2 Deposition Over a 5 Year Period (2005-2009)

PLOT FILE OF PERIOD VALUES FOR SOURCE GROUP: ALL — g/m^2

0.100 | 0.200 | 0.300

COMMENTS:	SOURCES:	COMPANY NAME:	
Coordinate Datum = UTM NAD83 Zone 16N Values represent the total (wet + dry) sulfur dioxide deposition for a five year period. Multiply by 0.5 g S/g SO2 to obtain grams of Sulfur per square meter. Wet Deposition is approximately 0.1% of total deposition.	10	Golder Associates Inc.	
	RECEPTORS: 453	MODELER: Ryan Birkenholz, PE	Golder Associates
	OUTPUT TYPE: Total Depos.	SCALE: 1:21,473 0 — 0.5 km	
	MAX: 0.38497 g/m^2	DATE: 9/28/2011	PROJECT NO.: 103-81277

APPENDIX A

ELECTRONIC SUBMITTAL SUBMITTED ON ENCLOSED COMPACT DISK

- VISCREEN MODEL FILES
- NO_2 and SO_2 DEPOSITION MODEL FILES

APPENDIX B
ILLINOIS NATIONAL HERITAGE DATABASE

Illinois Threatened and Endangered Species by County

Illinois Natural Heritage Database

as of April 12, 2011

Important Note: The Illinois Natural Heritage Database is updated daily with data pertaining to threatened and endangered species occurrences in Illinois. Please check this website quarterly for updates to this list or contact Database staff directly at tara.kieninger@illinois.gov.

Please note that because many birds observed in the state are merely migrants passing through, we typically only track those sightings which have evidence of breeding (nest with young, breeding and/or nesting behavior in adults, juveniles observed, etc.). We normally do not track instances where a bird is observed perched on a tree branch, flying in the air, or feeding unless other evidence of breeding is witnessed or there is an existing breeding record for the species in the area.

State Status:

LE - listed as endangered

LT - listed as threatened

Scientific Name	Common Name	State Status	# of Occurrences	Last Observed
Adams				
Acipenser fulvescens	Lake Sturgeon	LE	1	1966-09-28
Carex prasina	Drooping Sedge	LT	1	1989-06-15
Cumberlandia monodonta	Spectaclecase	LE	1	1987-07-19
Delphinium carolinianum	Wild Blue Larkspur	LT	2	1971-05-20
Dendroica cerulea	Cerulean Warbler	LT	2	2007-06-30
Ellipsaria lineolata	Butterfly	LT	2	2008-10-06
Elliptio crassidens	Elephant-ear	LT	1	1987-06-18
Fusconaia ebena	Ebonyshell	LT	2	2008-10-06
Hybognathus hayi	Cypress Minnow	LE	1	2004-09-16
Ictinia mississippiensis	Mississippi Kite	LT	1	1990-07-13
Lanius ludovicianus	Loggerhead Shrike	LE	2	1989
Liatris scariosa var. nieuwlandii	Blazing Star	LT	4	2005-03-15
Ligumia recta	Black Sandshell	LT	1	2008-10-06
Melanthium virginicum	Bunchflower	LT	1	1944-06-29
Myotis grisescens	Gray Bat	LE	1	2000-02-08
Myotis sodalis	Indiana Bat	LE	8	2010-07-28
Pandion haliaetus	Osprey	LE	1	1986-SUM
Plethobasus cyphyus	Sheepnose	LE	1	1987-07-19
Poa wolfii	Wolf's Bluegrass	LE	1	2003-05-22
Scirpus polyphyllus	Bulrush	LT	1	1989-06-15
Thryomanes bewickii	Bewick's Wren	LE	1	1998-07
Tomanthera auriculata	Ear-leafed Foxglove	LT	1	1943-08-29
Trifolium reflexum	Buffalo Clover	LT	1	2003-05-22
Trillium viride	Green Trillium	LE	1	2002-04-15
Viburnum molle	Arrowwood	LT	3	2004-11-06

Scientific Name	Common Name	State Status	# of Occurrences	Last Observed

Moultrie

Scientific Name	Common Name	State Status	# of Occurrences	Last Observed
Lanius ludovicianus	Loggerhead Shrike	LE	3	2001-06-19
Ligumia recta	Black Sandshell	LT	1	2003-09-26
Notropis boops	Bigeye Shiner	LE	3	1967-07-01

Total # of Species 4

Ogle

Scientific Name	Common Name	State Status	# of Occurrences	Last Observed
Amelanchier sanguinea	Shadbush	LE	1	1994-05
Arctostaphylos uva-ursi	Bearberry	LE	1	1986
Asclepias lanuginosa	Wooly Milkweed	LE	1	2009-SUM
Aster furcatus	Forked Aster	LT	2	2009-08-15
Bartramia longicauda	Upland Sandpiper	LE	1	2006-07-11
Besseya bullii	Kittentails	LT	9	2009-SU
Betula alleghaniensis	Yellow Birch	LE	2	2006-10-05
Carex cryptolepis	Sedge	LE	1	2010-07-21
Carex echinata	Sedge	LE	1	1994-05
Carex woodii	Pretty Sedge	LT	1	1990
Castilleja sessiliflora	Downy Yellow Painted Cup	LE	2	2009-SUM
Ceanothus herbaceus	Redroot	LE	1	1996-06-21
Cornus canadensis	Bunchberry	LE	3	2001-06-14
Corydalis sempervirens	Pink Corydalis	LE	1	1993-04-29
Cyclonaias tuberculata	Purple Wartyback	LT	2	2009-07-21
Cypripedium acaule	Moccasin Flower	LE	1	1999-05-19
Dichanthelium boreale	Northern Panic Grass	LE	1	1994-05
Emydoidea blandingii	Blanding's Turtle	LE	3	2008-06-15
Equisetum pratense	Meadow Horsetail	LT	3	1994-05
Equisetum sylvaticum	Horsetail	LE	2	2009-06-02
Erimystax x-punctatus	Gravel Chub	LT	5	1998-07-31
Filipendula rubra	Queen-of-the-prairie	LE	1	2000-10-26
Gymnocarpium dryopteris	Oak Fern	LE	1	2009-06-02
Helianthus giganteus	Tall Sunflower	LE	1	2010-10-05
Hemidactylium scutatum	Four-toed Salamander	LT	1	2003-05-03
Heterodon nasicus	Plains Hog-nosed Snake	LT	3	1997-05-18
Lanius ludovicianus	Loggerhead Shrike	LE	1	1990-06-16
Lathyrus ochroleucus	Pale Vetchling	LT	1	1992-05-13
Lespedeza leptostachya	Prairie Bush Clover	LE	2	2009-SUM
Ligumia recta	Black Sandshell	LT	5	2009-07-22
Luzula acuminata	Hairy Woodrush	LE	2	2010-06-24
Lycopodium clavatum	Running Pine	LE	1	2006-10-05
Lycopodium dendroideum	Ground Pine	LE	1	1995-06-13
Nothocalais cuspidata	Prairie Dandelion	LE	5	1995-06-02

Scientific Name	Common Name	State Status	# of Occurrences	Last Observed
Ogle				
Phegopteris connectilis	Long Beech Fern	LE	1	1989-06-09
Sorbus americana	American Mountain Ash	LE	1	2001-06-14
Speyeria idalia	Regal Fritillary	LT	1	2007-07-25
Sullivantia sullivantii	Sullivantia	LT	2	1995-06-04
Terrapene ornata	Ornate Box Turtle	LT	2	2009-09-18
Tomanthera auriculata	Ear-leafed Foxglove	LT	1	1969-08-22
Trientalis borealis	Star-flower	LE	2	2001-06-14
Woodsia ilvensis	Rusty Woodsia	LE	2	2010-06-24
	Total # of Species 42			
Peoria				
Acipenser fulvescens	Lake Sturgeon	LE	1	2007-04-28
Agalinis skinneriana	Pale False Foxglove	LT	1	2004-09-16
Apalone mutica	Smooth Softshell	LE	2	2007-09-18
Boltonia decurrens	Decurrent False Aster	LT	4	2008-10-14
Corallorhiza maculata	Spotted Coral-root Orchid	LT	1	2001-06-14
Ixobrychus exilis	Least Bittern	LT	1	2004-06-19
Lanius ludovicianus	Loggerhead Shrike	LE	1	2006-07-27
Pandion haliaetus	Osprey	LE	1	2009-05-12
Rallus elegans	King Rail	LE	1	1988-05-26
Spermophilus franklinii	Franklin's Ground Squirrel	LT	1	2009-06-06
Viburnum molle	Arrowwood	LT	2	2004-10-29
	Total # of Species 11			
Perry				
Asio flammeus	Short-eared Owl	LE	1	2009-04-08
Botaurus lentiginosus	American Bittern	LE	1	2003-06-15
Circus cyaneus	Northern Harrier	LE	1	2003-04-05
Crotalus horridus	Timber Rattlesnake	LT	1	1983-07-28
Gallinula chloropus	Common Moorhen	LE	1	1993-06-28
Ixobrychus exilis	Least Bittern	LT	1	2001-06-05
Lanius ludovicianus	Loggerhead Shrike	LE	1	2003-07-23
Myotis sodalis	Indiana Bat	LE	1	1988-08-29
Oryzomys palustris	Rice Rat	LT	1	2008-11-11
Platanthera flava var. herbiola	Tubercled Orchid	LT	1	2002-06-25
Rallus elegans	King Rail	LE	1	1999-07-24
Tyto alba	Barn Owl	LE	4	2010-11-28
	Total # of Species 12			
Piatt				

Scientific Name	Common Name	State Status	# of Occurrences	Last Observed
Will				
Somatochlora hineana	Hine's Emerald Dragonfly	LE	5	2007-07-31
Spermophilus franklinii	Franklin's Ground Squirrel	LT	3	2009-08-31
Terrapene ornata	Ornate Box Turtle	LT	1	1996-03-12
Tetraneuris herbacea	Lakeside Daisy	LE	1	2002-05-01
Tomanthera auriculata	Ear-leafed Foxglove	LT	7	2009-09-01
Trifolium reflexum	Buffalo Clover	LT	2	2009-06-17
Triglochin palustris	Slender Bog Arrow Grass	LT	2	2004-07-09
Tyto alba	Barn Owl	LE	1	2006-09-29
Vaccinium macrocarpon	Large Cranberry	LE	2	2003-08-01
Valerianella chenopodifolia	Corn Salad	LE	1	1987-05-02
Veronica scutellata	Marsh Speedwell	LT	1	2009-08-24
Viola canadensis	Canada Violet	LE	1	1986
Xanthocephalus xanthocephalus	Yellow-headed Blackbird	LE	1	1991-05-09
	Total # of Species **64**			
Williamson				
Asplenium bradleyi	Bradley's Spleenwort	LE	1	1994-09
Bartramia longicauda	Upland Sandpiper	LE	1	1987
Crotalus horridus	Timber Rattlesnake	LT	2	1993-06-07
Dodecatheon frenchii	French's Shootingstar	LT	1	2002-08-13
Eryngium prostratum	Eryngo	LE	1	1993-07-13
Etheostoma exile	Iowa Darter	LT	1	2001-04-13
Ixobrychus exilis	Least Bittern	LT	1	1993-06-30
Lampetra aepyptera	Least Brook Lamprey	LT	1	2010-10-08
Matelea decipiens	Climbing Milkweed	LE	2	1991-06-04
Nyctanassa violacea	Yellow-crowned Night-Heron	LE	1	2007-05-31
Ochrotomys nuttalli	Golden Mouse	LT	1	1985-04-30
Orconectes indianensis	Indiana Crayfish	LE	8	2010-09-08
Oryzomys palustris	Rice Rat	LT	5	2010-03-03
Paspalum dissectum	Bead Grass	LE	1	1987-09-11
Rhexia mariana	Dull Meadow Beauty	LE	5	2002-08-29
Scleria pauciflora	Carolina Whipgrass	LE	1	1983-07-04
Spiranthes vernalis	Spring Ladies' Tresses	LE	1	1991-06-23
Thryomanes bewickii	Bewick's Wren	LE	1	1987-06-24
Trillium viride	Green Trillium	LE	1	1987-04-27
Tyto alba	Barn Owl	LE	3	2010-02
	Total # of Species **20**			
Winnebago				
Alnus incana ssp. rugosa	Speckled Alder	LE	1	1991-05-06

Scientific Name	Common Name	State Status	# of Occurrences	Last Observed
Winnebago				
Amelanchier interior	Shadbush	LT	1	1993-08-30
Ammocrypta clarum	Western Sand Darter	LE	1	1968-08-17
Arctostaphylos uva-ursi	Bearberry	LE	1	1987
Artemisia dracunculus	Dragon Wormwood	LE	2	2004-08-19
Asclepias lanuginosa	Wooly Milkweed	LE	4	2008-06-12
Aster furcatus	Forked Aster	LT	4	2001-08-24
Bartramia longicauda	Upland Sandpiper	LE	2	1988-06-26
Besseya bullii	Kittentails	LT	8	2009-SU
Botrychium matricariifolium	Daisyleaf Grape Fern	LE	2	1993-06-12
Botrychium multifidum	Northern Grape Fern	LE	2	1987
Botrychium simplex	Dwarf Grape Fern	LE	2	1993-06-12
Calopogon tuberosus	Grass Pink Orchid	LE	1	1977-11-04
Carex echinata	Sedge	LE	1	1988-07-02
Carex inops ssp. heliophila	Sedge	LE	3	1957-05-26
Castilleja sessiliflora	Downy Yellow Painted Cup	LE	1	1990-07-10
Ceanothus herbaceus	Redroot	LE	1	1990-07-10
Chimaphila umbellata	Pipsissewa	LE	3	1993-06-12
Circus cyaneus	Northern Harrier	LE	1	1991-07
Comptonia peregrina	Sweetfern	LE	1	1993-10-21
Corallorhiza maculata	Spotted Coral-root Orchid	LT	3	1998
Cyclonaias tuberculata	Purple Wartyback	LT	1	1986-06-17
Cypripedium candidum	White Lady's Slipper	LT	1	2000-05-20
Dendroica cerulea	Cerulean Warbler	LT	2	PRE-1976-08-12
Elliptio dilatata	Spike	LT	1	2005-08-25
Elymus trachycaulus	Bearded Wheat Grass	LT	1	1977
Emydoidea blandingii	Blanding's Turtle	LE	5	2007-06-12
Erimystax x-punctatus	Gravel Chub	LT	6	2008-08-19
Etheostoma exile	Iowa Darter	LT	6	1999-10-05
Fundulus dispar	Starhead topminnow	LT	2	1998-08-26
Helianthus giganteus	Tall Sunflower	LE	2	1988-07-02
Hesperia ottoe	Ottoe Skipper	LE	2	1991-07
Ictinia mississippiensis	Mississippi Kite	LT	1	2010-08-13
Juncus vaseyi	Vasey's Rush	LE	1	1994
Juniperus communis	Ground Juniper	LT	2	2000-05-04
Juniperus horizontalis	Trailing Juniper	LE	1	2005-02-17
Lanius ludovicianus	Loggerhead Shrike	LE	2	2005-07-06
Lechea intermedia	Pinweed	LT	1	1977
Lespedeza leptostachya	Prairie Bush Clover	LE	4	2009
Ligumia recta	Black Sandshell	LT	7	2009-08-26
Notropis texanus	Weed Shiner	LE	1	1963-08-29

Winnebago

Scientific Name	Common Name	State Status	# of Occurrences	Last Observed
Nyctanassa violacea	Yellow-crowned Night-Heron	LE	1	2010-08-21
Oenothera perennis	Small Sundrops	LT	1	1990
Penstemon grandiflorus	Large-flowered Beard Tongue	LE	1	1994-06-24
Rallus elegans	King Rail	LE	1	1995
Ranunculus rhomboideus	Prairie Buttercup	LT	2	1995-04-28
Sambucus racemosa ssp. pubens	Red-berried Elder	LE	2	1988-06
Sparganium americanum	American Burreed	LE	1	1987-06-30
Spermophilus franklinii	Franklin's Ground Squirrel	LT	1	1958-06
Terrapene ornata	Ornate Box Turtle	LT	1	2008
Ulmus thomasii	Rock Elm	LE	1	1988
Vaccinium corymbosum	Highbush Blueberry	LE	1	1988-08

Total # of Species 52

Woodford

Scientific Name	Common Name	State Status	# of Occurrences	Last Observed
Bartramia longicauda	Upland Sandpiper	LE	1	2010-07-01
Boltonia decurrens	Decurrent False Aster	LT	4	2008-10-14
Coccyzus erythropthalmus	Black-billed Cuckoo	LT	1	2009-06-28
Cypripedium reginae	Showy Lady's Slipper	LE	1	1999-06-10
Elliptio dilatata	Spike	LT	1	2001-08-31
Filipendula rubra	Queen-of-the-prairie	LE	1	2007-07-24
Lanius ludovicianus	Loggerhead Shrike	LE	1	2007-06-30
Mimulus glabratus	Yellow Monkey Flower	LE	1	1989-06-23
Viburnum molle	Arrowwood	LT	1	1999-09-02

Total # of Species 9

APPENDIX C
ECOLOGICAL RISK ASSESSMENT FOR FEDERAL ENDANGERED/THREATENED SPECIES